SC1224
VERSION 2
FIELD
SERVICE
MANUAL

ATARI

ATARI®

C070433
FEB. 1986

CONTENTS

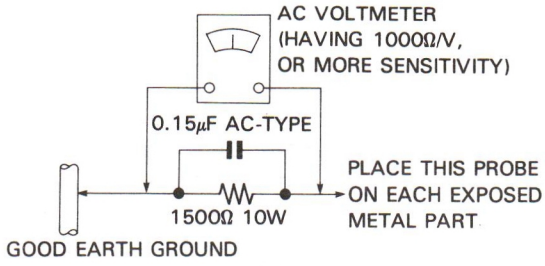
SPECIFICATIONS

Type		: 12-inch color CRT display
Picture tube		: 12'', 90° deflection, In-line electron guns. Dot trio phosphor (0.385 mm pitch) Short persistence Polish/dark grey
Type No.		: M29JAM60X
Power supply		: 120 V AC 50/60 Hz
Power consumption		: 120 V AC 1.0 A
Input signal		: R,G,B separated ANALOG level (1.0 Vp-p) H.V. sync. (nega.) TTL level
Input impedance		: 75 Ω
Input connector		: 13 pin DIN connector
Video band width		: 16 MHz (– 3 dB)
Scanning frequency	H	: 15.75 kHz
	V	: 60 Hz
Retrace time	H	: 16 μsec
	V	: 1000 μsec
Anode voltage		: 22.0 kV
Recomendable display area		: 216(H) × 160(V) mm
Dimension		: 326(W) × 295(H) × 377(D) mm
Weight		: 10 kg

* Design and specifications subject to change without notice.

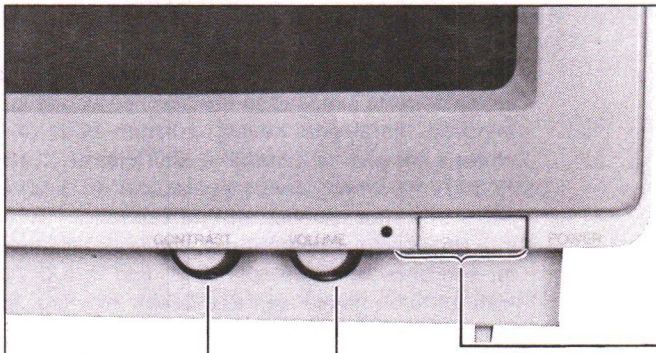
SAFETY PRECAUTION

1. The design of this product contains special hardware, many circuits and components specially for safety purposes.
   For continued protection, no changes should be made to the original design unless authorized in writing by the manufacturer. Replacement parts must be identical to those used in the original circuits. Service should be performed by qualified personnel only.
2. Alterations of the design or circuitry of monitor should not be made. Any design alterations or additions will void the manufacturer's warranty and will further relieve the manufacturer of responsibility for personal injury or property damage resulting therefrom.
3. Many electrical and mechanical parts in monitor sets have special safety-related characteristics. These characteristics are often not evident from visual inspection nor can the protection afforded by them necessarily be obtained by using replacement components rated for higher voltage, wattage, etc. Replacement parts which have these special safety characteristics are identified in the parts list of Service manual. **Electrical components having such features are identified by shading on the schematics and by (⚠) on the parts list in Service manual.** The use of a substitute replacement which does not have the same safety characteristics as the recommended replacement part shown in the parts list in Service manual may create shock, fire, or other hazards.
4. If any repair has been made to the chassis, it is recommended that the B_1 setting should be checked or adjusted (See ADJUSTMENT OF B_1 POWER SUPPLY).
5. The high voltage applied to the picture tube must conform with that specified in Service manual. Excessive high voltage can cause an increase in X-Ray emission, arcing and possible component damage, therefore operation under excessive high voltage conditions should be kept to a minimum, or should be prevented. If severe arcing occurs, remove the AC power immediately and determine the cause by visual inspection (incorrect installation, cracked or melted high voltage harness, poor soldering, etc.). To maintain the proper minimum level of soft X-Ray emission, components in the high voltage circuitry including the picture tube must be the exact replacements or alternatives approvided by the manufacturer of the complete product.
6. Do not check high voltage by drawing an arc. Use a high voltage meter or a high voltage probe with a VTVM. Discharge the picture tube before attempting meter connection, by connecting a clip lead to the ground frame and connecting the other end of the lead through a 10kΩ 2W resistor to the anode button.
7. When service is required, observe the original lead dress. Extra precaution should be given to assure correct lead dress in the high voltage circuit area. Where a short circuit has occurred, those components that indicate evidence of overheating should be replaced. Always use the manufacturer's replacement components.
8. ISOLATION CHECK
   (SAFETY FOR ELECTRICAL SHOCK HAZARD)
   After re-assembling the product, always perform an isolation check on the exposed metal parts of the cabinet (metal cabinet, screwheads, control shafts, etc.) to be sure the product is safe to operate without danger of electrical shock.
   (1) DIELECTRIC STRENGTH TEST
   The isolation between the AC primary circuit and all metal parts exposed to the user, particularly any exposed metal part having a return path to the chassis should withstand a voltage of 1,100V (3,000V AC when power input is 220V AC and over) AC (r.m.s.) for a period of one second.
   (..... Withstand a voltage of 1,100 V AC (r.m.s.) to an appliance rated up to 120 V, and 3,000 V AC (r.m.s.) to an appliance rated 200 V or more, for a period of one second.)
   This method of test requires a test equipment not generally found in the service trade.
   (2) LEAKAGE CURRENT CHECK
   Plug the AC line cord directly into the AC outlet (do not use a line isolation transformer during this check.) Using a "Leakage Current Tester", measure the leakage current from each exposed metal part of the cabinet, particularly any exposed metal part having a return path to the chassis, to a known good earth ground (water pipe, etc.). Any leakage current must not exceed 0.5mA AC (r.m.s.).
   • ALTERNATE CHECK METHOD
   Plug the AC line cord directly into the AC outlet (do not use a line isolation transformer during this check.). Use an AC voltmeter having 1,000 ohms per volt or more sensitivity in the following manner. Connect a 1500Ω 10W resistor paralleled by a 0.15μF AC-type capacitor between an exposed metal part and a known good earth ground (water pipe, etc.).
   Measure the AC voltage across the resistor with the AC voltmeter.
   Move the resistor connection to each exposed metal part, particularly any exposed metal part having a return path to the chassis, and measure the AC voltage across the resistor. Now, reverse the plug in the AC outlet and repeat each measurement. Any voltage measured must not exceed 0.35V AC (r.m.s.). This corresponds to 0.5mA AC (r.m.s.).



FUNCTIONS

FRONT

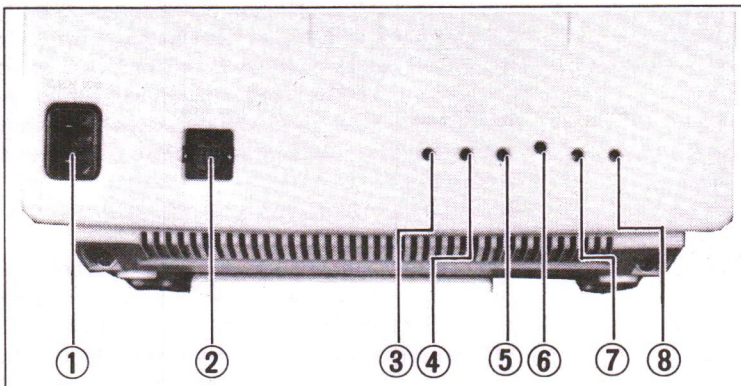


POWER SWITCH/POWER Indicator
Depress this switch to supply power.
The indicator lights.
Depress this switch again to turn the power off.

AUDIO VOLUME control
Rotate to adjust sound level to your preference.

CONTRAST control
Rotate to adjust the contrast to your preference.

REAR



① **AC INPUT connector**
Connect to the power cord.

② **SIGNAL Input connector**
Connect to the signal output of the computer.

③ **BRIGHTNESS control**
Rotate to adjust the brightness to your preference.

④ **Vertical Hold control**
Rotate to adjust the vertical synchro.

⑤ **Vertical Height control**
Rotate to adjust the vertical amplitude.

⑥ **Vertical Position control**
Rotate to adjust the vertical position.

⑦ **Horizontal Position control**
Rotate to adjust the horizontal position.

⑧ **Horizontaol Hold control**
Rotate to adjust the horizontal synchro.
(For adjustment of the controls ③ ~ ⑧, use a small screw driver.)

HOW TO REMOVE FOR SERVICE

■ REMOVING REAR CABINET

1. Unplug the power supply cord and unscrew the five screws marked Ⓐ shown in Fig. 1.

■ REMOVING THE MAIN P.B. CHASSIS

* after removing the rear cover

1. Remove the two screws marked Ⓑ in Fig. 2.
2. Remove the two screws marked Ⓒ in Fig. 3.
3. Remove the two screws marked Ⓓ in Fig. 4.

[* if necessary:
remove the bracket marked Ⓔ in Fig. 4.
remove the anode wire and other wires.]

4. Withdraw the main P.B. (shown in Fig. 5.)

* When conducting a check with pwer supplied, be sure to confirm that the CRT earth wire is connected to the CRT socket board and the main P.B.

* **Notes:**
When disconnect to the CRT socket P.C.B., coat silicon on the CRT socket.

■ REMOVING THE BOTTOM COVER

* after removing the main P.C.B.

1. Remove the five screws marked Ⓕ in Fig. 6.

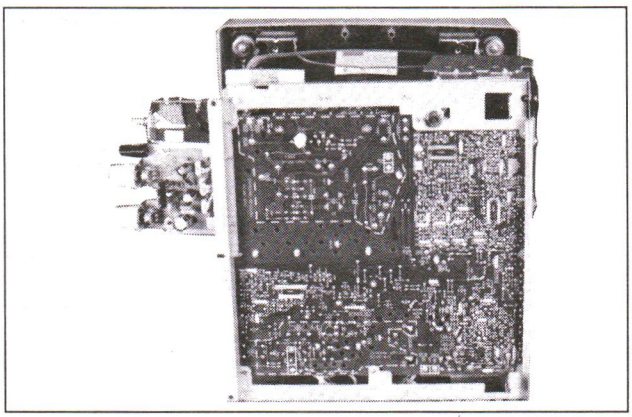


Fig. 5

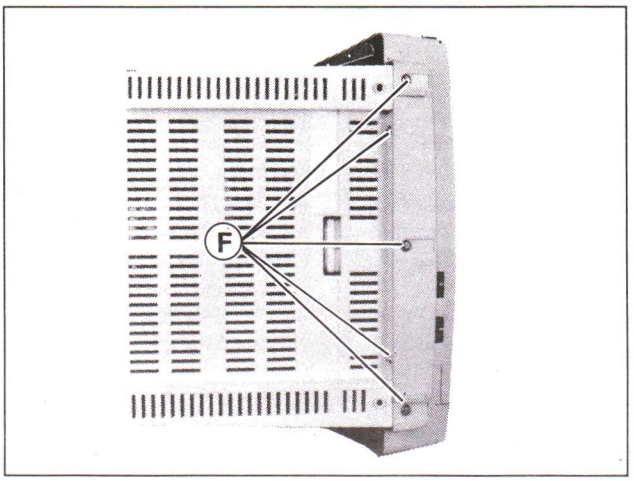


Fig. 6

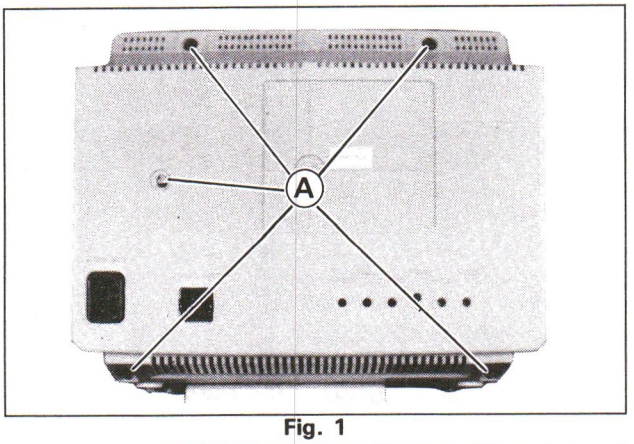


Fig. 1

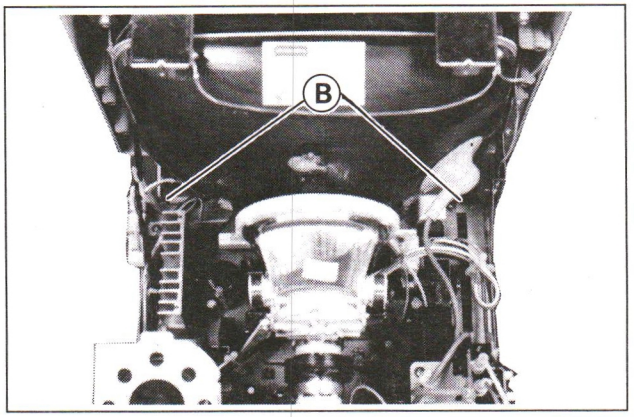


Fig. 2

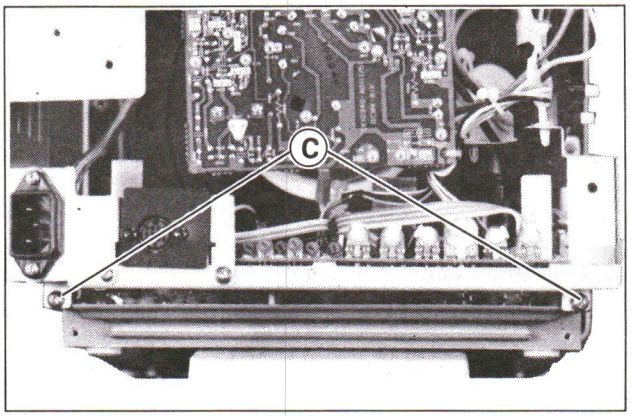


Fig. 3

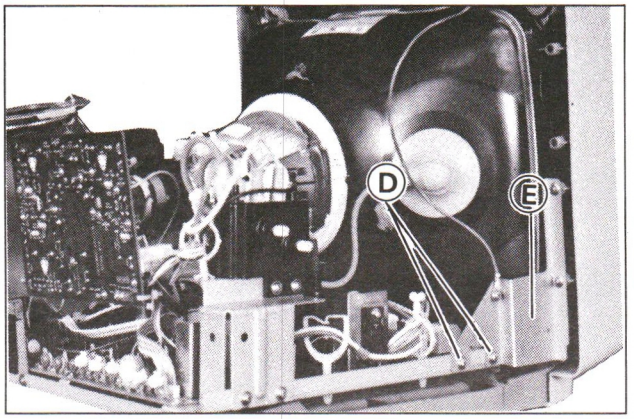
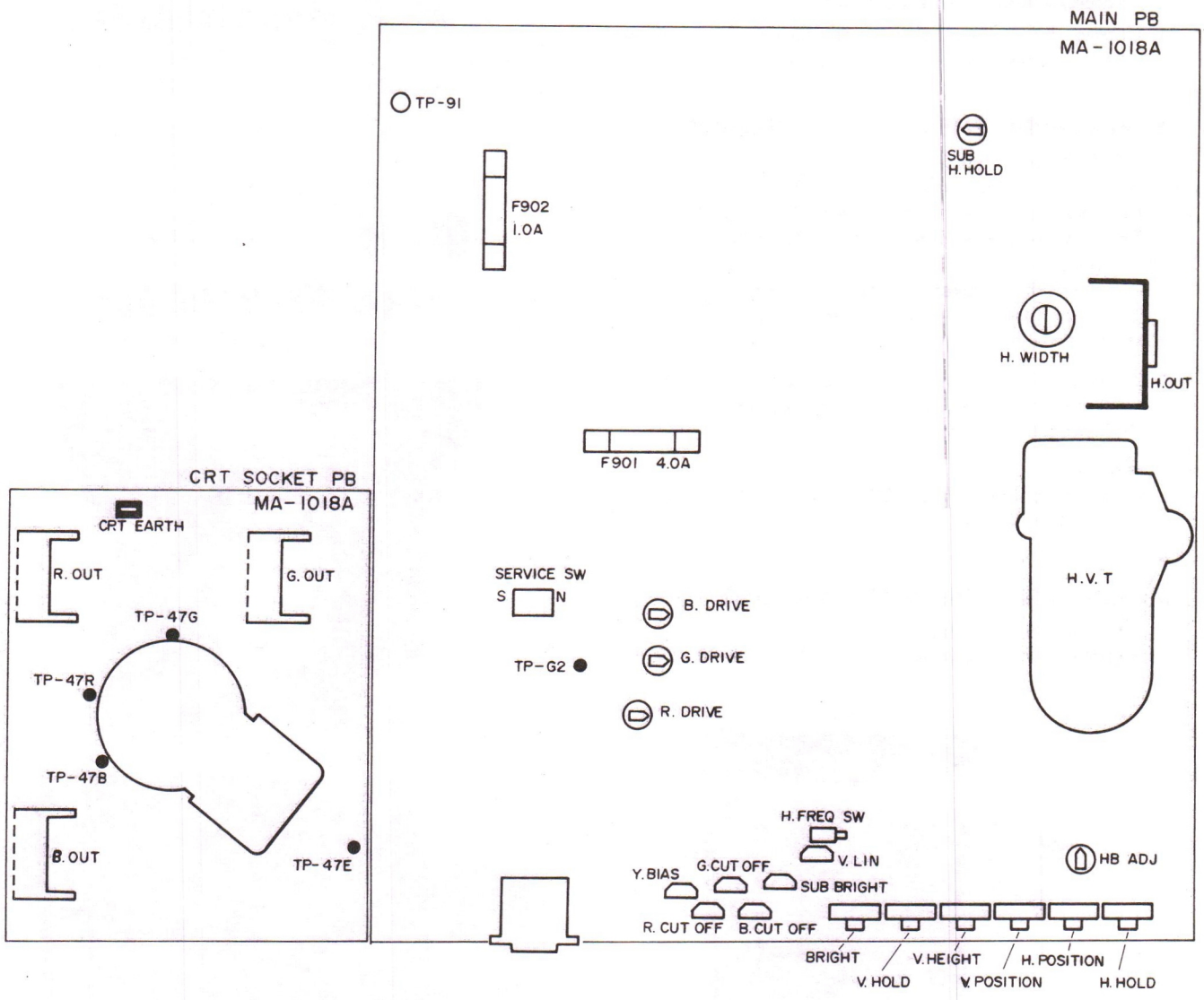


Fig. 4

ALIGNMENT LOCATIONS



SERVICE ADJUSTMENTS

PREPARATION BEFORE MAKING ADJUSTMENT

1. Measuring instruments and jigs required for adjustment.
   - RGB signal generator (make use of analog output), output level: 1.0 $V_{B\text{-}W}$
   - Oscilloscope
   - Voltmeter (Digital voltmeter, Tester, etc.)
   - Knob screw driver
   - Hexagon core wrench
   - Scale
2. Turn the power on the unit to be adjusted and the measuring instruments at least 30 minutes beforehand for warming-up.
3. Before adjusting each section, confirm that the following rough adjustments have been completed.
   (1) Confirm that the white balance has been adjusted. If it is out of order, adjust it by following the description in "White Balance Adjustment".
   (2) Adjust the vertical synchronization by using the V. HOLD VR (R1432), and confirm also that the horizontal synchronization is normal. If it is out of order, adjust it by following the descripions in "H. HOLD Adjustment".
   (3) Adjust HB ADJ VR (R1570) until HB voltage to obtain 120 V.
   (4) Display the letter "@" and confirm that the picture is in focus.

GENERAL ADJUSTMENTS

1. H. Hold Adjustment
   (1) Set the H. Position VR (R1516) to the mechanical center position.
   (2) Display "H" or white over the entire screen.
   (3) Set the H. FREQ SW (SW1501) to turn the out.
   (4) Turn the H. HOLD VR (R1506) until the picture is almost stable.
   (5) Set the H. FREQ SW to the center position.

2. Adjustments of Horizoantal Amplitude
   (1) Display closs-hatch (or "H") over the entire screen.
   (2) Adjust the H. WIDTH ADJ coil (L1522) until the picture size becomes 216 mm.

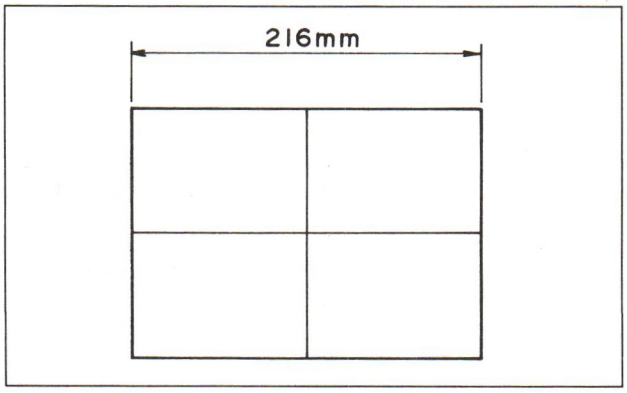


Fig. 2-1

3. V. Hold Adjustment
   (1) Display "H" over the entire screen.
   (2) Adjust the V. HOLD VR (R1432) until the picture is vertically stable.

4. Adjustments of Vertical Amplitude, V. Center, and V. Linearity
   (1) Display closs-hatch (or "H") over the entire screen.
   (2) Adjust V. HEIGHT VR (R1408) until the entire length from top to bottom of the raster is 160 mm.
   (3) Adjust V. LINE VR (R1406) until the length A and B in **Fig. 4-1** becomes equal.
   (4) Adjust V. POSI VR (R1429) until the picture is positioned at the center of the screen.

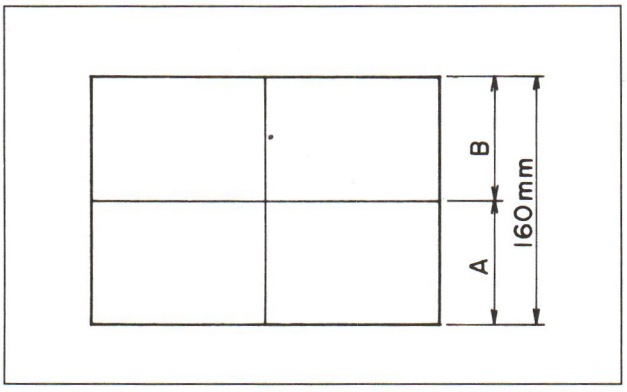


Fig. 4-1

5. Black Level Adjustment
   (1) Set the BRIGHT and SUB BRIGHT VR to the mechanical center position.
   (2) Display black over the entire screen.
   (3) Connect the oscilloscope to the TP-G2 and adjust the Y. BIAS VR (R1006) so that it becomes DC 6.0 V.

6. Bright Pulse Adjustment
   (1) Display black over the entire screen.
   (2) Set the BRIGHT VR (R1019) to the center position.
   (3) Connect the oscilloscope to TP-G2.
   (4) Adjust the SUB BRIGHT VR (R1015) until no pulse is generated.

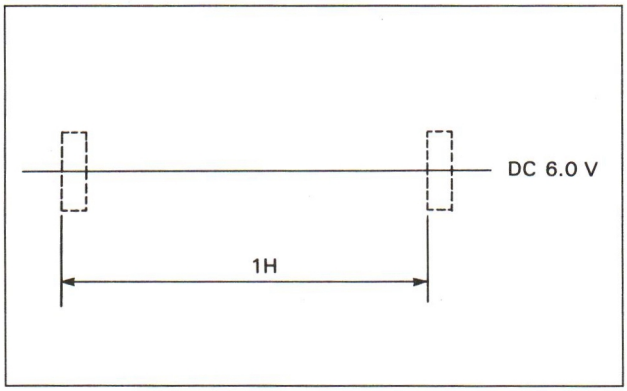


Fig. 6-1

7. White Balance Adjustment
   (1) Display black over the entire screen.
   (2) Turn the CUT OFF VR (R1025, R1028, R1031) and the SCREEN VR fully counterclockwise.
   (3) Connect the oscilloscope to TP-47R, G and B, and adjust the CUT OFF VR until each output becomes 105 V.
   (4) Set the SERVICE SW (SW1401) to the S side.
   (5) Turn the SCREEN VR clockwise to a position where a single line is faintly displayed.
   (6) Not using the CUT OFF VR which produced a color first, but using the other two CUT OFF VRs, adjust the colors until the three colors emit a little light at the same level.
   (7) Set the SERVICE SW to the N side.
   (8) Set the CONTRAST VR (R1013) to max.
   (9) Display white over the entire screen.
   (10) Connect the oscilloscope to TP-47B and adjust the B. DRIVE VR (R1304) so that the drive voltage from the black to white levels becomes 30 Vp-p.
   (11) Adjust the DRIVE VRs for R and G (excluding that for B) until the raster becomes white.

8. Focusing Adjustment
   (1) Display the leter @ over the entire screen (against the black background).
   (2) The CONTRAST VR (R1013) should be turned to the position where leter @ is almost saturated.
   (3) Adjust the FOCUS VR until the center and peripheral areas are uniformly in focus.

COLOR-ADJUSTING MODES FOR CRT DISPLAY

* Make an adjustment when replacing a cathode-ray tube or when color shading occurs.
Basically, adjustment can be made in the same manner as for television, but, concerning display characterisitcs, it requires a greater degree of accuracy than television. Moreover, functions such as convergence take place in a quite delicate manner because a high-fineness CRT or medium-fineness CRT are used as the cathode-ray tube. Therefore, extreme care should be exercised when carrying out the adjustment.

■ CRT REPLACEMENT AND PREPARATIONS TO BE CONDUCTED BEFORE COMMENCING ADJUSTMENT

1. Wipe the entire CRT body lightly with a cloth.
2. Wind adhesive tape around two places on the neck part of the CRT. (Fig. 1)

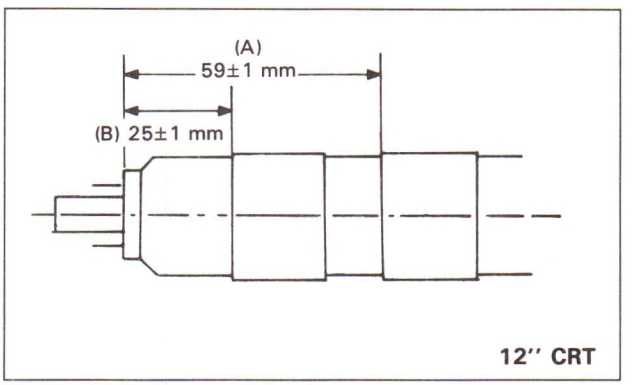


Fig. 1

3. Insert a deflecting yoke into the neck of the CRT without removing the tape.
4. Fasten a clamp screw so that the deflecting yoke is easily turned.
5. Attach a PC magnet and fasten a clamp screw.
6. As it is affected by the earth's magnetism, point the front of the CRT tube to the east or west (when a setting place is known beforehand, set it accordingly).
7. After attaching and wiring the deflecting yoke, CRT, socket, anode and earth, turn the switch ''on'' and confirm that a picture appears. Then make sure to demagnetize the entire CRT with a demagnetized coil.

■ PURITY ADJUSTMENT

Before starting the adjustment

1. Demagnetize with a degaussing coil.
2. Remove the adhesive which is fixing the 6 magnet plates using a screwdriver, and loosen the magnet lock so that the magnet plates can be turned.

Adjusting Modes

1. Turn a green cutoff VR and a red/blue cutoff VR to the extreme right and left, respectively. Under this condition, the raster is easier to see when adjusting a screen VR.
2. Loosen the clamp screw fastening the deflecting yoke and draw the deflecting yoke to the extreme rear to produce round-shaped color shading (when phosphors of the RGB is coated in stripes, it appears as vertical stripes).
3. Overlap the long and short tabs of two purity mangets alternately and temporarily set them in a horizontal position.
4. Making and breaking the tabs of the two purity magnets, set a green circle (or a vertical stripe) in the center of the screen.
5. Push the deflecting yoke forward, and fix it so that the entire screen becomes green.
6. Produce a horizontal line and correct the inclination of it with the deflecting yoke (do not alter the forward and rear positions of the deflecting yoke).
7. Bring the single line back.
8. Fasten the deflecting yoke so that it does not move both forward and backward (do not change the inclination or forward and rear positions of it).
9. Fasten the magnet lock tightly.
10. Produce a white screen and degauss it, then check if there is any color shading.
    * If color shading appears, the deflecting yoke is either leaning forward or backward, and should be corrected.

■ STATIC (CENTER) CONVERGENCE ADJUSTMENT

Before Adjustment

1. Display a cross-hatch pattern.
2. Moving the deflecting yoke up and down and to the right and left, adjust the convergence around the periphery. Also, temporarily place a wedge on the upper part of the deflecting yoke. **(Fig. 2)**

Adjusting Mode

1. Overlap red and blue lines in the center of the screen with a four-pole magnet and produce a magenta color.
2. Overlap the red/blue (magenta) line placed in the center of the screen and the green line with a six-pole magnet.
3. Repeating 1 and 2, perfectly match the longitudinal and vertical lines located in the center of the screen.

■ DYNAMIC (PERIPHERY) CONVERGENCE ADJUSTMENT

Adjusting Mode

1. Remove the wedge with which the deflecting yoke was temporarily fixed.
2. Oscillating the deflecting yoke up and down, set a convergence of points, L, R, T and B, on the screen and temporarily fix it with a wedge. **(Fig. 4)**
3. Maintaining that situation, oscillate the deflecting yoke right and left and set the convergence of points, L, R, T and B, on the screen. **(Fig. 5)**
4. Repeating 2 and 3, fix the position of the deflecting yoke with 3 wedges so as to produce the best condition for the convergence of points L, R, T and B, on the screen. Removable paper of the double-sided adhesive tape on the wedges should be removed first, and as **Fig. 6** shows, the first wedge should be fixed directly below the deflecting yoke with the other two 120 degrees away from the first one on the deflecting yoke, using doublesided adhesive tape after they are firmly inserted into position.
5. After complection of static-dynamic convergence adjustment, fix the magnet lock. (At that time, center convergence might cause an aberration. If this happens, unlock it and repeat the convergence adjustment until it does not cause any aberration.)

Note 1. The double-side tape on the wedges loses adhesion once it is used. Use new tape as needed.

Note 2. When a wedge is inserted, the deflecting yoke moves slightly backward, so fix the deflecting yoke slightly forward, for the time being, prior to insertion.

Note 3. If the convergence of the points, TR, TL, BR and BL are not within the standard values, correct them with the ribbon (magnetic body). (Refer to corresponding paragraphs.)

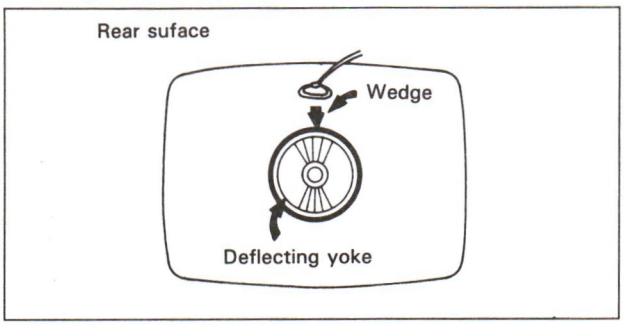


Fig. 2

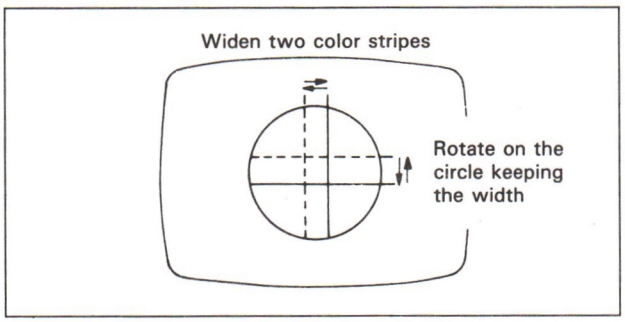


Fig. 3

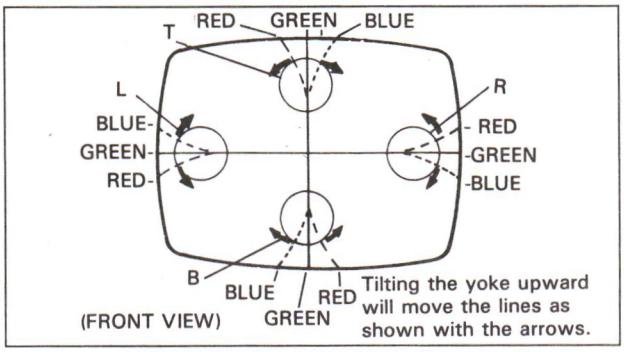


Fig. 4

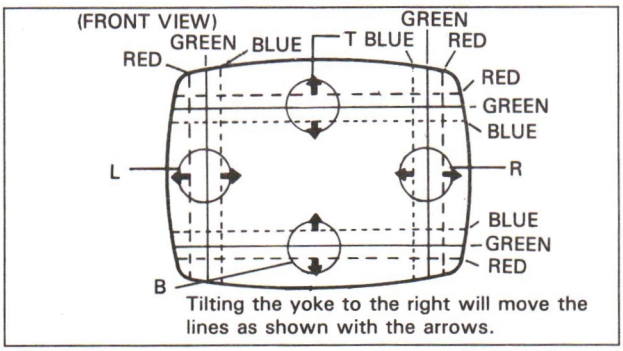


Fig. 5

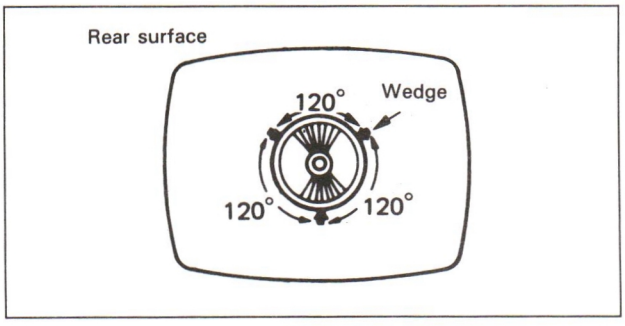


Fig. 6

■ CORRECTION MODES OF DYNAMIC (PERIPHERY) CONVERGENCE AND RIBBON (MAGNETIC MATERIAL)

- When the periphery (points TR, TL, BR, BL on the screen) convergence is nonstandardized, correct it by inserting a ribbon between the deflecting yoke and CRT funnel.
- For example, when correcting convergence of the point TR on the screen in **Fig. 7,** insert the ribbon in the upper-right position of the CRT facing the front.
  When looking at the convergence aberration of the point TR on the screen (longitudinal and vertical line), set the position of the ribbon and correct the convergence in accordance with the following steps.

1. Moving the ribbon toward the periphery, find the position where minimum aberration of the point TR is obtained. **(Fig. 8)**

2. Maintaining that position, adjust the depth for inserting the ribbon and correcting the quantity of convergence in order. **(Fig. 9)**

3. When the position for attaching the ribbon is set, fix it with double-sided adhesive tape.

Note When the ribbon is fixed in an improper location it might cause more aberration, so ensure to fix it in the correct position.

*** Part No. of the ribbon: CJ40070-00A**

■ AFTER COMPLETION OF PURITY-CONVERGENCE ADJUSTMENT

1. Fasten the clamp screw of the deflecting yoke tightly.
2. Wind and fasten the magnet lock tightly.
3. Coat the PC magnet with lerchlock **(Fig. 10)**
   *** Lerchlock Type name No. 3-C** NET 200g
   (Manufacturer-Raihiden Kagaku Kabushikigaisha)
4. Coat silicon on the three wedges. **(Fig. 10)**
   *** Silicon Type name KE4866** NET 100g
   (Shinetsu Kagaku)

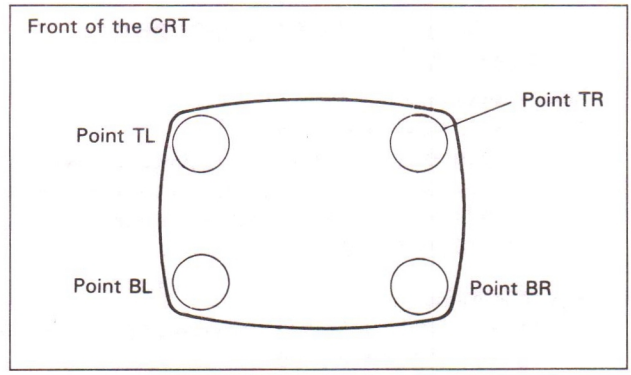


Fig. 7

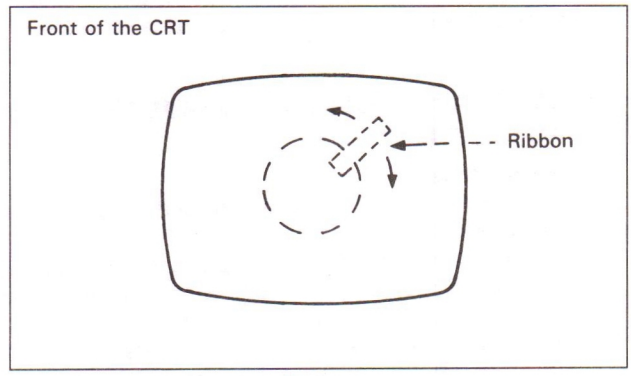


Fig. 8

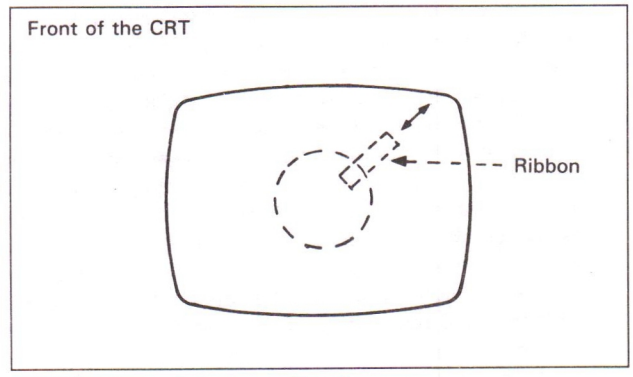


Fig. 9

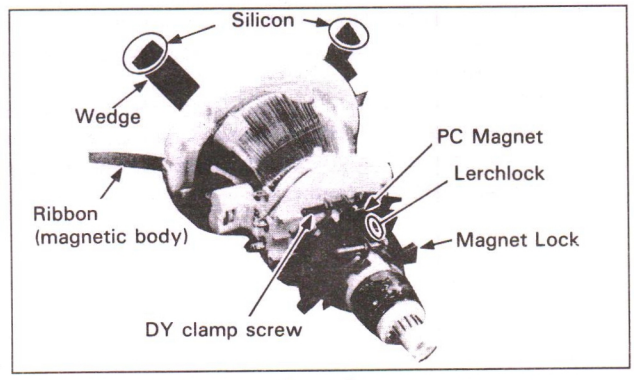


Fig. 10

REPLACEMENT PARTS LIST INFORMATION

PRODUCT SAFETY NOTE
Components identified by the ⚠ symbol in the PARTS LIST and the shaded areas on the Schematic have special characteristics important to safety. Before replacing any of these components read carefully the **SAFETY PRECAUTION** on Page 3 of this Service Manual.
DO NOT degrade the safety of the set through improper servicing.

1. ABBREVIATED WORD OF RESISTORS AND CAPACITORS

RESISTOR

C R	:	Carbon Resistor
Comp. R	:	Composition Resistor
OM R	:	Oxide Metal Film Resistor
V R	:	Variable Resistor
MF R	:	Metal Film Resistor
UNF R	:	Nonflammable Resistor
F R	:	Fusible Resistor
CH MG R	:	Chip Metal Glaze Resistor

CAPACITOR

C Cap.	:	Ceramic Capacitor
M Cap.	:	Mylar Capacitor
E Cap.	:	Electrolytic Capacitor
BP E Cap.	:	Bi-Polar (or Non-Polar) Electrolytic Capacitor
MM Cap.	:	Metalized Mylar Capacitor
PP Cap.	:	Polypropylene Capacitor
MPP Cap.	:	Metalized PP Capacitor
PS Cap.	:	Polystyrol Capacitor
Tan. Cap.	:	Tantal Capacitor
CH C Cap.	:	Chip Ceramic Capacitor

2. FOLLOWING RESISTORS AND CAPACITORS OF STANDARD ELECTRICAL COMPONENTS ARE OMITTED FROM THIS PARTS LIST. EACH PART NUMBER OF THESE STANDARD REPLACEMENT COMPONENTS IS DEFINED AS FOLLOWS.

Carbon Resistor (C R): Lead form (—⊂⊃—)

Rating	Part No.
1/4W	QRD141J – □□□ (CR: 1/4W; Tolerance; Lead form; Constant term)
1/2W	QRD121J – □□□

Composition Resistor (Comp. R): Lead form (—▭—)

Rating	Part No.
1/2W	QRC121K – □□□ (Comp. R: 1/2W; Tolerance; Lead form; Constant term)

Myler Capacitor (M Cap.): Lead form ( )

Withstand Voltage	Part No.
50V	QFM41HK – □□□ (M Cap.; Lead form; 50V; Tolerance; Constant term)
100V	QFM42AK – □□□
200V	QFM42DM – □□□

Ceramic Capacitor (C Cap.): Lead form ( )

Withstand Voltage	Parts No.
50V	QCS11HJ – □□□ (C Cap.; 50V; Lead form; Tolerance; Constant term)
500V	QCS12HP – □□□

Electrolytic Capacitor (E Cap.): Lead form ( )

Withstand Voltage	Parts No.
6.3V	QET40JR – □□□ (E Cap; 6.3V; Lead form; Tolerance; Constant term)
10V	QET41AR – □□□
16V	QET41CR – □□□
25V	QET41ER – □□□
50V	QET41HR – □□□

Chip Metal Glaze Resistor (CH MG R)

Chip name	Chip No.	Substitutional Part No.
CH MG R	QRS148J – □□□ (CH MG R; Constant term; Tolerance; 1/4W; Chip)	QRD141J-□□□ CR 1/4W ±5%

Chip Ceramic Capacitor (CH C Cap)

Chip name	Chip No.	Substitutional Part No.
CH C Cap	QCS81HJ – □□□ (CH C Cap; 50V; Constant term; Chip; Tolerance)	QCS11HJ-□□□ C Cap 50V ±5%

3. DECODING OF TOLERANCE AND CONSTANT TERM

TOLERANCE

J: ±5% K: ±10% M: ±20% N: ±30% H: $^{+50}_{-10}$%

Z: $^{+80}_{-20}$% P: $^{+100}_{-0}$% R: $^{+30}_{-10}$%

CONSTANT TERM

- **Carbon Resistor (1/4W, ±5% Tolerance)**

QRD141J – □□□ (CONSTANT TERM.)

– □□□		2.7Ω	→ QRD141J-2R7
1R0	→ 1.0Ω	47kΩ	→ 47×10^3 → QRD141J-473
9R7	→ 9.7Ω		
10□	→ 10□ means $10\times10^{□}$ (Ω)		
82□	→ 82□ means $82\times10^{□}$ (Ω)		

- **Ceramic Capacitor (50 Volts, ±5% Tolerance)**

QCS11HJ – □□□ (CONSTANT TERM.)

– □□□		5pF	→ QCS11HJ-5R0
1R0	→ 1.0pF	680pF	→ 68×10^1 → QCS11HJ-681
8R0	→ 8.0pF	3300pF	→ 33×10^2 → QCS11HJ-332
10□	→ 10□ means $10\times10^{□}$ (pF)		
88□	→ 88□ means $88\times10^{□}$ (pF)		

REPLACEMENT PARTS LIST

MA-1018A (MAIN P.C.B. ASS'Y)

SYMBOL No.	⚠	PART No.	PART NAME	REMARK
VARIABLE RESISTOR				
R1006		A76195-102	VR	1kΩ B (Y. BIAS)
R1013		CEX40208-B23M	〃	2kΩ B (CONTRAST)
R1015		A76195-472	〃	4.7kΩ (SUB BRIGHT)
R1019		QVZ3234-023	〃	2kΩ B (BRIGHT)
R1025		A76195-102	〃	1kΩ B (R CUT OFF)
R1028		〃 -102	〃	〃 B (G CUT OFF)
R1031		〃 -102	〃	〃 B (B CUT OFF)
R1104		QVZ3507-102	〃	1kΩ B (RED DRIVE)
R1204		〃 -102	〃	〃 B (GREEN DRIVE)
R1304		〃 -102	〃	〃 B (BLUE DRIVE)
R1406		A76195-471	〃	470Ω (V. LINEARITY)
R1408		QVZ3234-022	〃	200Ω B (V. HEIGHT)
R1429		QVZ3211-052	〃	500Ω B (V. POSITION)
R1432		QVZ3234-053	〃	5kΩ B (V. HOLD)
R1506		〃 -023	〃	2kΩ B (H. HOLD)
R1516		QVZ3234-013	〃	1kΩ B (H. POSITION)
R1570		QVZ3506-103	〃	10kΩ B (HB ADJ.)
R1572		QVZ3507-222	〃	2.2kΩ (SUB H. HOLD)
R1610		CEX40208-B14M	〃	10kΩ B (VOLUME)
RESISTOR				
R1102		QRD149J-100S	CR	10Ω 1/4W J
R1120		QRG029J-221A	OM R	220Ω 2W 〃
R1121		QRZ0069-122	UNF R	1.2kΩ 5W K
R1157		QRV141F-75R0AY	MF R	75Ω 1/4W F
R1161,2		〃 -2200AY	〃	220Ω 〃 〃
R1202		QRD149J-100S	CR	10Ω 〃 J
R1220		QRG029J-221A	OM R	220Ω 2W 〃
R1221		QRZ0069-122	UNF R	1.2kΩ 5W K
R1257		QRV141F-75R0AY	MF R	75Ω 1/4W F
R1261,2		〃 -2200AY	MF R	220Ω 〃 〃
R1302		QRD149J-100S	CR	10Ω 〃 J
R1320		QRG029J-221A	OM R	220Ω 2W 〃
R1321		QRZ0069-122	UNF R	1.2kΩ 5W K
R1357		QRV141F-75R0AY	MF R	75Ω 1/4W F
R1361,2		〃 -2200AY	〃	220Ω 〃 〃
R1414		QRG019J-392S	OM R	3.9kΩ 1W J
R1421	⚠	QRX029J-1R8A	MF R	1.8Ω 2W 〃
R1434		QRX019J-5R6S	MF R	5.6Ω 1W 〃
R1542		QRG019J-182S	OM R	1.8kΩ 〃 〃
R1511		〃 -101S	〃	100Ω 2W 〃
R1525		〃 -102S	〃	1kΩ 1W 〃
R1531	⚠	QRX029J-1R8A	MF R	1.8Ω 2W 〃
R1534		QRG019J-471S	OM R	470Ω 1W 〃
R1551	⚠	QRX019J-2R7S	MF R	2.7Ω 〃 〃
R1564		QRG019J-183S	OM R	18kΩ 〃 〃
R1565		QRG029J-152A	〃	1.5kΩ 2W 〃
R1566		QRG019J-472S	〃	4.7kΩ 1W 〃
R1571		QRV141F-5101AY	MF R	5.1kΩ 1/4W F
R1607		QRX019J-5R6S	〃	5.6Ω 1W J
R1701		QRG019J-330S	OM R	33Ω 〃 〃
R1702	⚠	QRV141F-2002Y	MF R	20kΩ 1/4W F
R1705	⚠	〃 -1402Y	〃	14kΩ 〃 〃
R1902	⚠	QRF076K-2R0	UNF R	2Ω 7W K
R1904		QRD129J-103S	CR	10kΩ 1/2W J
R1907	⚠	QRX029J-4R7A	MF R	4.7Ω 2W 〃
R1908		QRD149J-221S	CR	220Ω 1/4W 〃
R1909		〃 -390S	〃	39Ω 〃 〃
R1910	⚠	QRZ0056-685Z	COMP. R	6.8MΩ 1/2W K
CAPACITOR				
C1081		QEH51EM-107M	E Cap.	100μF 25V M
C1105		QEN61HM-474Z	BP E Cap.	0.47μF 50V 〃
C1151		〃 -475Z	〃	4.7μF 〃 〃
C1152		〃 -335Z	〃	3.3μF 〃 〃

SYMBOL No.	⚠	PART No.	PART NAME	REMARK
C1205		QEN51HM-474	BP E Cap.	0.47μF 50V M
C1251		QEN51HM-475	〃	4.7μF 〃 〃
C1252		QEN61HM-335Z	〃	3.3μF 〃 〃
C1305		〃 -474Z	〃	0.47μF 〃 〃
C1311		QET52CR-106	E Cap.	10μF 160V R
C1351		QEN51HM-475	BP E Cap.	4.7μ 50V M
C1352		QEN61HM-335Z	〃	3.3μF 〃 〃
C1402		QEE61CK-225BZ	Tan. Cap.	2.2μF 16V K
C1404		QFZ0083-104M	M Cap.	0.1μF 50V 〃
C1406		QFZ0083-563MZ	〃	0.056μF 〃 〃
C1423		QETC1VM-107Z	E Cap.	100μF 35V M
C1424		QETB1EM-477	〃	470μF 25V 〃
C1425		QETB1VM-477	〃	〃 35V 〃
C1427		QETB1CM-108	〃	1000μF 16V 〃
C1429		〃 -477	〃	470μ 16V 〃
C1503		QETC1EM-227Z	〃	220μF 25V 〃
C1508		QETC1CM-107Z	〃	100μF 16V 〃
C1509		QFP32AJ-682M	PP Cap.	6800pF 100 V J
C1522		QET62CR-105Z	E Cap.	1μF 160V R
C1523		QET52CR-336	E Cap.	33μF 〃 〃
C1526	⚠	QFZ0081-7201S	MPP Cap.	7200pF 1600V ±3%
C1529		QFZ0067-304S	MPP Cap.	0.3μF 200V K
C1530		QET61ER-106Z	E Cap.	10μF 25V R
C1531		QETB1EM-477	〃	470μF 〃 M
C1532		QET52CR-106	〃	10μF 160V R
C1534	⚠	QFZ0081-5601S	MPP Cap.	5600pF 1600V ±3%
C1541		QET62CR-105Z	E Cap.	1μF 160V R
C1551		QETB1CM-108	〃	1000μF 16V M
C1581		QFH53BK-223M	MM Cap.	0.022μF 1250V K
C1610		QEU51CM-108M	E Cap.	1000μF 16V M
C1702		QETB1EM-107	〃	100μF 25V 〃
C1901	⚠	QCZ9034-472A	C Cap.	4700pF AC250V P
C1902	⚠	QCZ9034-472A	〃	4700pF AC250V P
C1903	⚠	QCZ9034-472A	〃	4700pF AC250V P
C1904	⚠	QEU72DM-477M	E Cap.	470μF 200V M
C1905		QETB1EM-108	〃	1000μF 25V 〃
C1906	⚠	QFZ9025-104M	MF Cap.	0.1μF AC125V 〃
C1907		QET52CR-106	E Cap.	10μF 160V R
C1908	⚠	QFZ9025-104M	MF Cap.	0.1μF AC125V M
C1910	⚠	QCZ9034-472A	C Cap.	4700pF AC250V P
TRANSFORMER				
T1401	⚠	CE40795-00B	Side Pin Trans.	
T1521	⚠	CE40361-00H	H. Drive Transf.	
T1901	⚠	CE40489-00A	Power Transf.	
COIL				
L1101		A76186-2.7Z	Peaking Coil	2.7μH
L1102		〃 -8.2Z	〃	8.2μH
L1201		〃 -2.2	〃	2.2μH
L1202		〃 -10Z	〃	10μH
L1301		〃 -2.7	〃	2.7μH
L1302		〃 -8.2Z	〃	8.2μH
L1501		〃 -1000	〃	1000μH
L1521	⚠	CE40885-00A	Lin. Coil	
L1522	⚠	CE40140-00F	Width Coil	
L1523		CJ30030-100	Heater Choke	
L1524	⚠	CJ30030-028	〃	
L1561		A76186-1000	Peaking Coil	1000μH

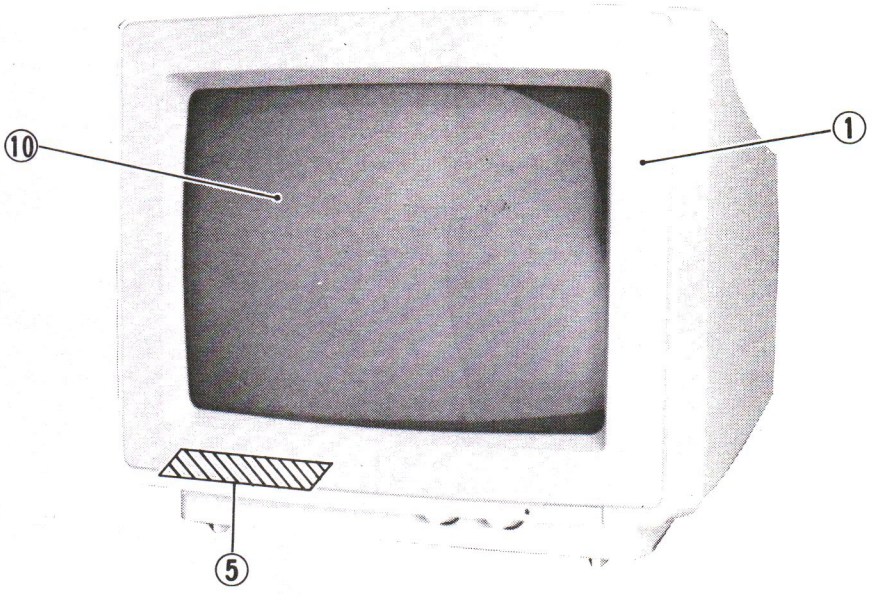
SYMBOL No.	⚠	PART No.	PART NAME	REMARK
DIODE				
D1001		1SS133-Y	Si. Diode	
D1002		1SS1555	〃	
D1003		1SS133-Y	〃	
D1004		1SS133-Y	〃	
D1006		RD6.8E(B2)	Zener Diode	
D1080		GL5HD23	LED	Power Ind.
D1101		RD20EB	Zener Diode	
D1151		1SS133-Y	Si. Diode	
D1201		RD20EB	Zener Diode	
D1251		1SS133-Y	Si. Diode	
D1301		RD20EB	Zener Diode	
D1351		1SS133-Y	Si. Diode	
D1404		1SR124-400-K	Si. Diode	
D1421		〃 -400-K	〃	
D1422		U19E-F	〃	
D1501		MA4110(M)-Y	Zener Diode	
D1503		1SR35-100-K	Si. Diode	
D1508		〃 -100-K	〃	
D1510		MA4110(M)-Y	Zener Diode	
D1521		U19E-F	Si. Diode	
D1522		U19E-F	〃	
D1523		RM2C	〃	
D1524		U19E-F	〃	
D1525		MA4220(M)-Y	Zener Diode	
D1541		1SR124-400-K	Si. Diode	
D1551		〃 -400-K	〃	
D1561		1SS146-Y	〃	
D1562~4		1SR124-400-K	〃	
D1565		MA4062(M)-Y	Zener Diode	
D1566		1SS146-Y	Si. Diode	
D1601		RD12E(B2)	Zener Diode	
D1701		1SR124-400-K	Si. Diode	
D1702	⚠	HZ7B2LV1	Zener Diode	
D1801		1SS133-Y	Si. Diode	
D1802		1SS133-Y	〃	
D1901	⚠	1S1887A	〃	
D1902	⚠	〃	〃	
D1903	⚠	〃	〃	
D1904	⚠	〃	〃	
D1905		1B4B42	Diode Bridge	
D1906		1SR124-400-K	Si. Diode	
TRANSISTOR				
Q1001		2SC1959(Y)-Y	Si. Transistor	
Q1002		2SA1015(Q,Y)	〃	
Q1003		2SA1015(Q,Y)-Y	〃	
Q1102		2SC1906	〃	
Q1103		2SC1906	〃	
Q1104		2SC1906	〃	
Q1105		2SA844(C)	〃	
Q1107		2SC1505	〃	
Q1108		2SC1973	〃	
Q1153		2SC1959(Y)-Y	〃	
Q1202		2SC1906	〃	
Q1203		〃	〃	
Q1204		〃	〃	

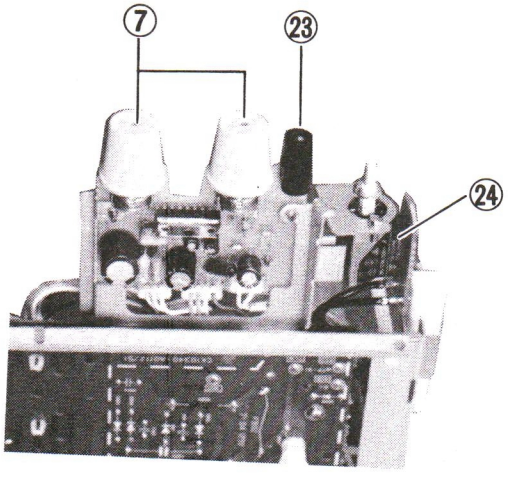
SYMBOL No.	⚠	PART No.	PART NAME	REMARK
Q1205		2SA844(C)	Si. Transistor	
Q1207		2SC1505	〃	
Q1208		2SC1973	〃	
Q1253		2SC1959(Y)-Y	〃	
Q1302		2SC1906	〃	
Q1303		〃	〃	
Q1304		〃	〃	
Q1305		2SA844(C)	〃	
Q1307		2SC1505	〃	
Q1308		2SC1973	〃	
Q1353		2SC1959(Y)-Y	〃	
Q1451		2SC1890A(E,F)	〃	
Q1501		2SC1815(Y,GR)Y	〃	
Q1521		2SD866A	〃	
Q1522	⚠	2SD1426	〃	or 2SD1554
Q1561		2SC1890A(E,F)	〃	
Q1562		2SD982	〃	
Q1563		2SC2230A	〃	
Q1801		2SC1959(Y)-Y	〃	
Q1802		2SC1959(Y)-Y	〃	
IC				
IC1001		AN5355	IC	RGB AMP & SW
IC1002		TA78L012AP	〃	VOLTAGE STAB.
IC1421		AN5515	〃	V. OUT
IC1501		HA11235	〃	V. H. OSC & H. AFC
IC1601		AN5265	〃	AUDIO
IC1801		TC4528BP	〃	SYNC PULS FORMER
IC1901	⚠	STR30125-A	〃	REGULATOR
OTHERS				
		CE40859-001	13P Din Socket	
	⚠	A75522-C	CRT Socket	
F1901	⚠	QMF66U1-4R0S	Fuse	4A
F1902	⚠	〃 -1R0S	〃	1A
LF1901	⚠	CE40906-00A	Line Filter	
SG1181		A75257	Arrestor	
SG1281		〃	〃	
SG1381		〃	〃	
SG1581		〃	〃	
SW1401		QSS1A22-C01	Slide Switch	SERVICE SW
SW1501		QSL4A13-C02	Lever Switch	H FREE RUN SW
SW1901	⚠	QSP4D11-C03	Push Switch	POWER SW
TH1901	⚠	CEX40137-001	TH Posistor	

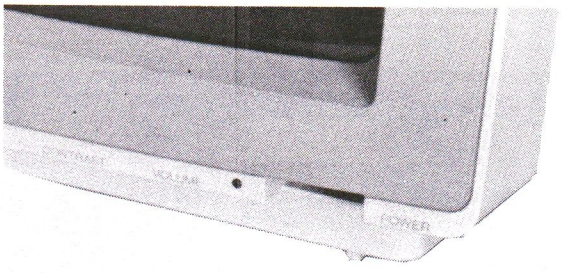
■ CHASSIS AND CABINET PARTS LIST

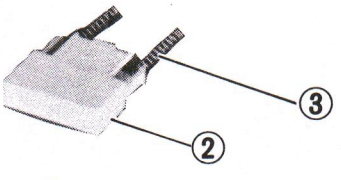
VIEW No.	SYMBOL No.	⚠	PART No.	PART NAME	REMARK
1			CM10520-C0A-M0	Front Panel Ass'y	
2			CM31560-A01	Power Knob	Within Front Panel Ass'y
3			CM30861-029	Spring	(X2) 〃
4			CM43279-001	LED Lens	〃
5			CM43229-001	Name Plate	〃
6			CM10409-C01-M0	Bottom Base	
7			CM31415-002	Control Knob	(X2) CONTRAST, VOLUME
8			SBSB4016N	Tap Screw	(X5)
9	R01		QRF208K-281	UNF R	280Ω 20W K
10		⚠	M29JAM60X-AC	Picture Tube	
11			CE40764-00A	Wedge Ass'y	(X3)
12			A75034-B	PC Magnet	
13		⚠	CJ39634-00C	Deg Coil	
14	DY01	⚠	CJ26500-00B	Def Yoke	
15			CH41434-00A	Braided Ass'y	
16		⚠	CJ40713-001	Focus Cover	(X2)
17	T01	⚠	CJ26449-00B	HVT	
18			HSA0899-01D	Speaker	
19		⚠	CE40811-00C	AC Inlet	
20			CM10408-A01-M0	Rear Cover	
21			CM43283-A01	Din Sheet	
22			CM31748-D01(R)	Roll R Label	
23	D1080		GL5HD23	LED	POWER Ind.
24	SW1901	⚠	QSP4D11-C03	Push Switch	POWER
25			CE40859-001	13 pin DIN Socket	
26			GBSB4016N	Tap Screw	(X5)
27	Q1522	⚠	2SD1426	Si Transistor	or 2SD1554

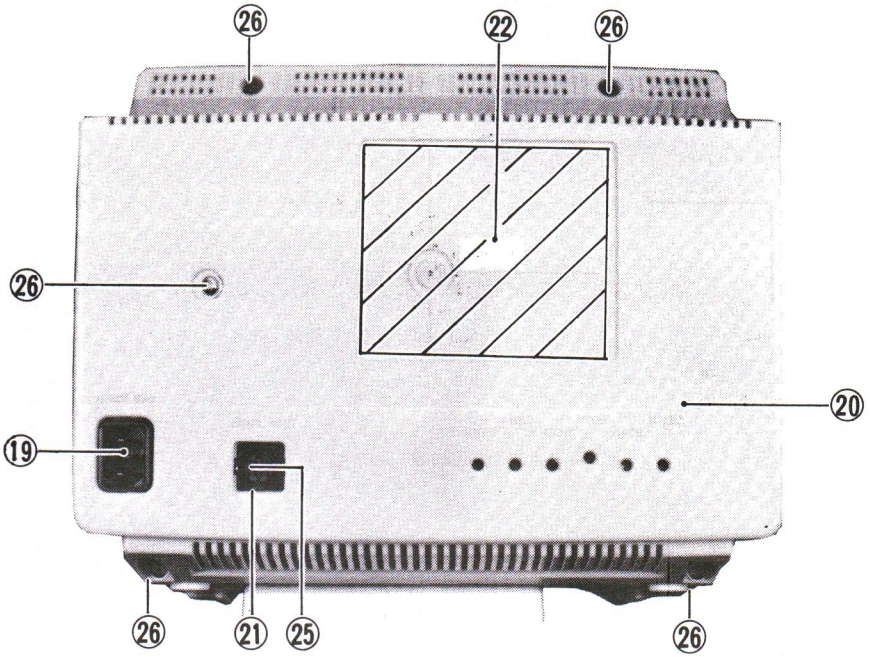
[EXPLODED VIEW]

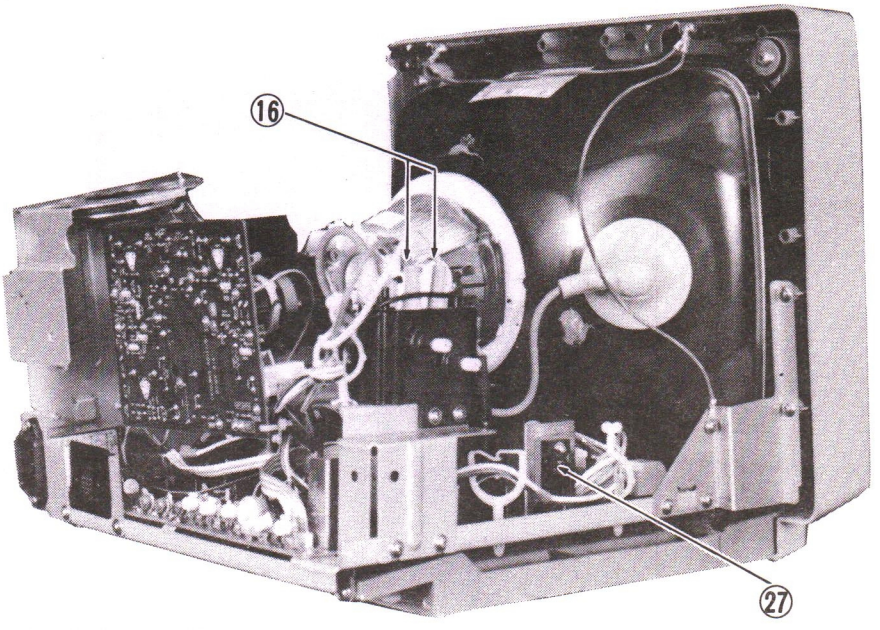








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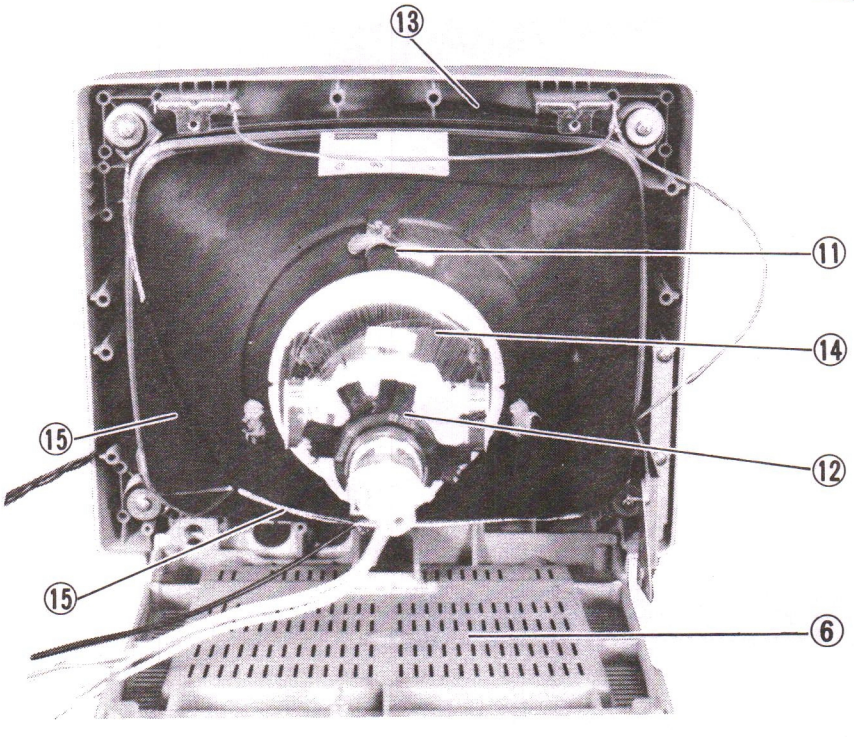
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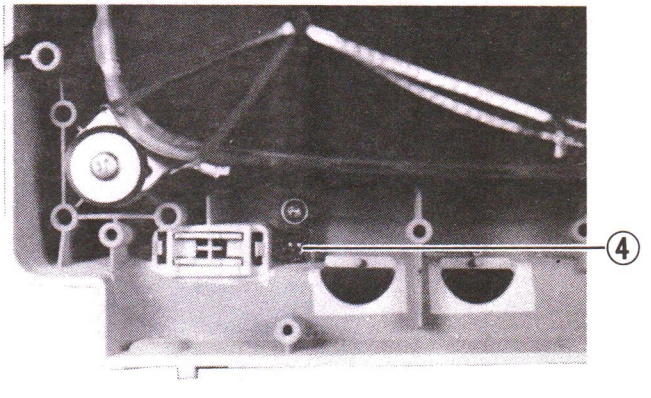
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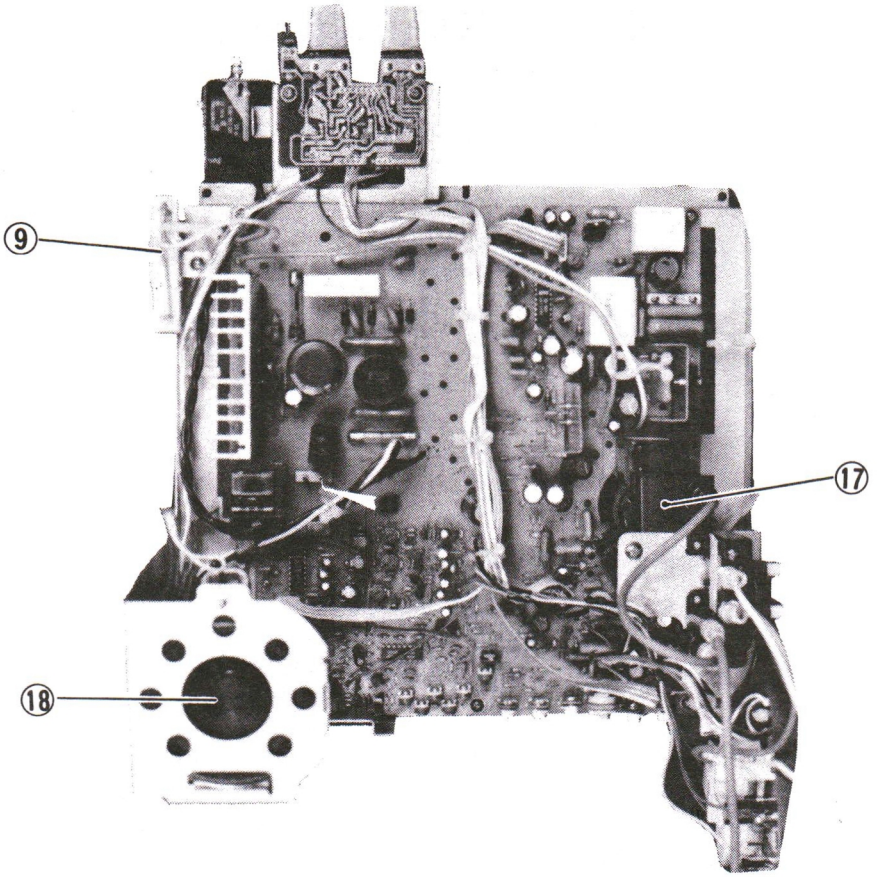
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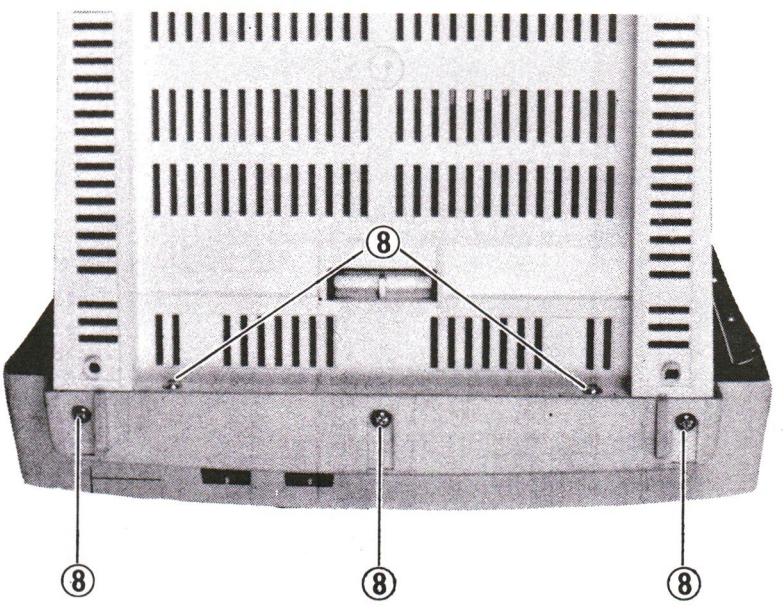
⑧
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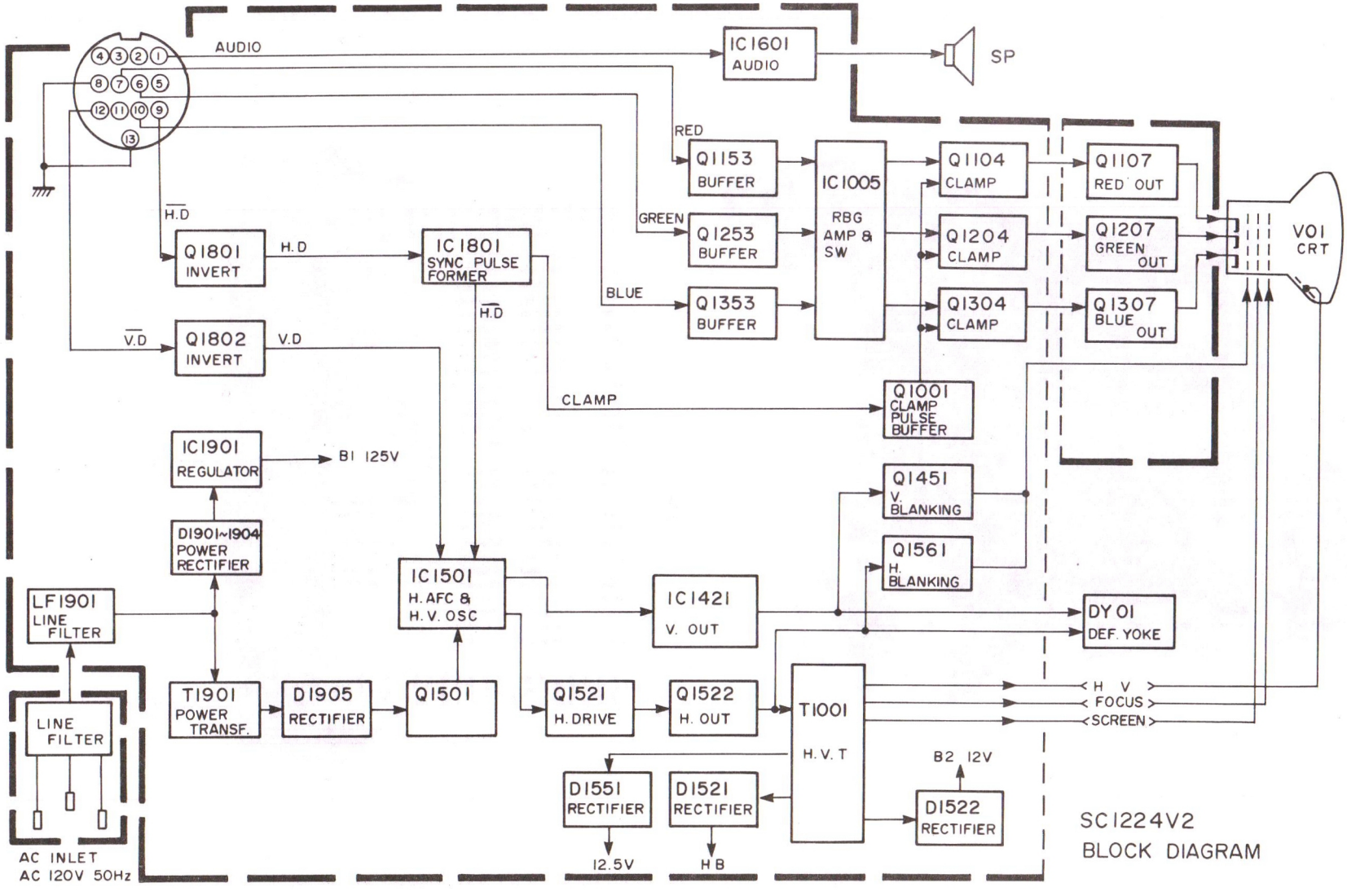
⑧

BLOCK DIAGRAM



SC1224V2
BLOCK DIAGRAM

TROUBLE SHOOTING

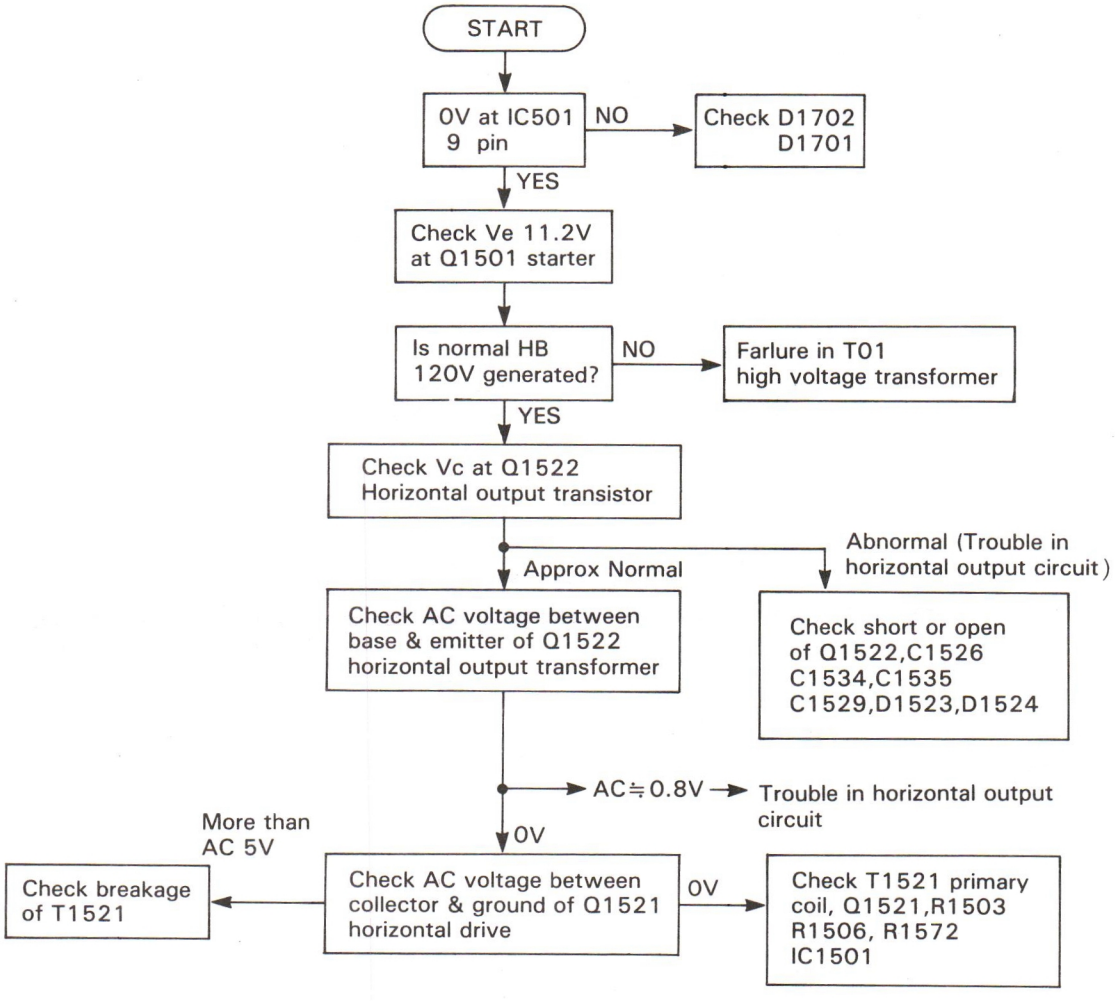
Problem 1. No raster, no sound (B1 is normal)

[Cause]

Horizontal deflection circuit

Problems in the horizontal deflection circuit binder generation of high focusing voltage, HB 120V and B2 15V, resulting in no raster, no sound.

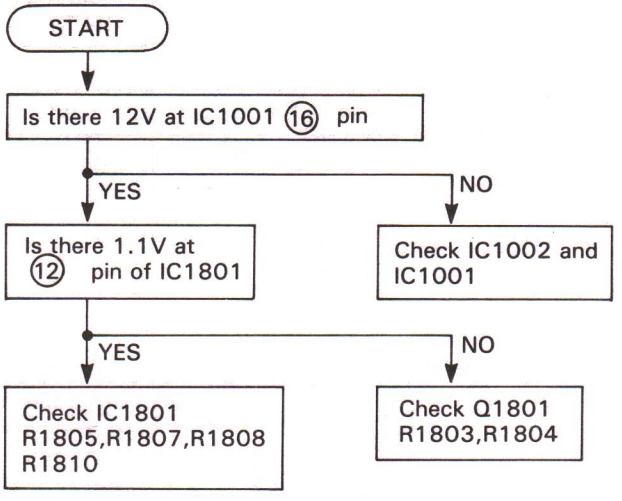
[Trouble discrimination chart]



Problem 2. No picture (no raster) with normal sound

[Cause]
Sound is had but no picture, therefore the faulty part is IC1001. IC1801 and its external elements.
Check also the circuit for igniting the CRT heater and the high voltage module.

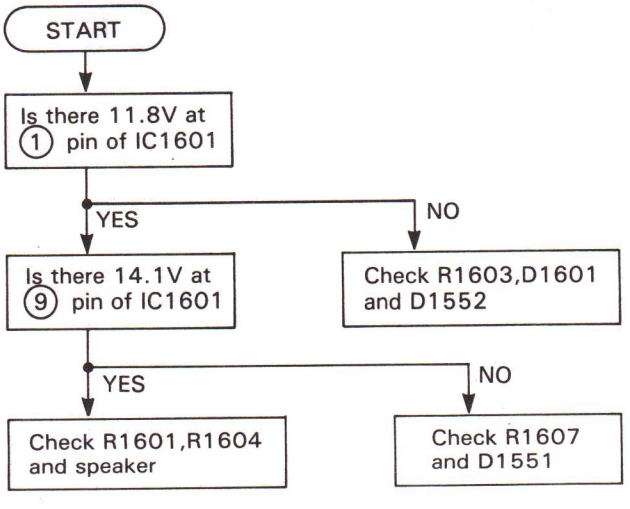
[Trouble discrimination chart]



Problem 3. No sound (with normal picture)

[Cause]
Trouble in the audio circuit.
IC1601 and its external elements are faulty.

[Trouble discrimination chart]

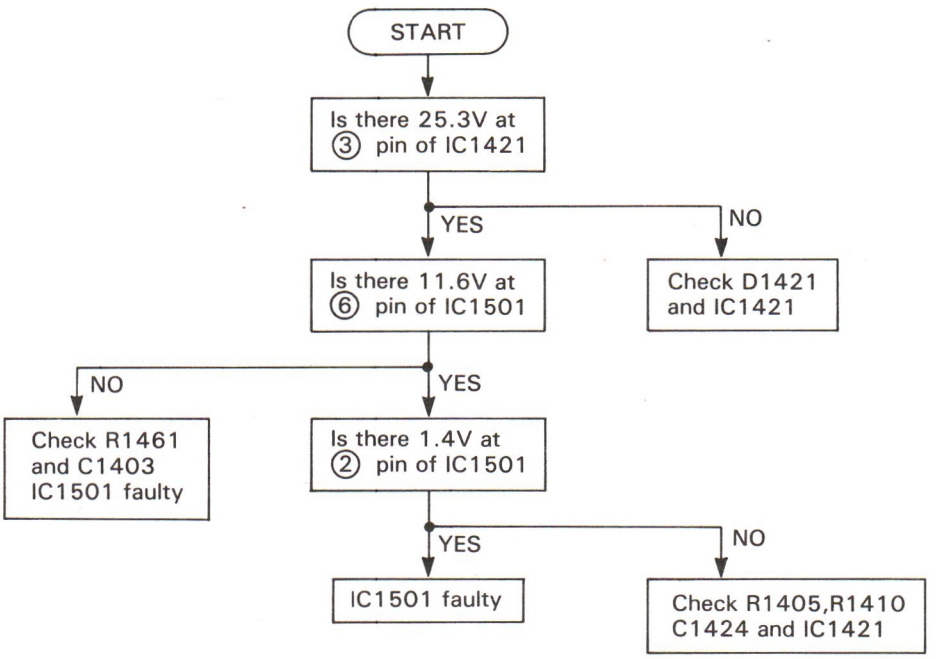


Problem 4. Only single horizontal line, normal sound

[Cause]

Manufaction of the vertical deflection circuit.
When the vertical deflection circuit is faulty, saw-tooth current is not applied to the vertical deflection coil, resulting in a single horizontal line.

[Trouble discrimination chart]



[Faulty parts and problems other than described]

R1434	Vertical amplitude small (a half of screen)
R1452	The upper part of the screen becomes black
R1410	A little vertical shock of single horizontal line

Problem 5. Improper horizontal or vertical synchronization

[Cause]

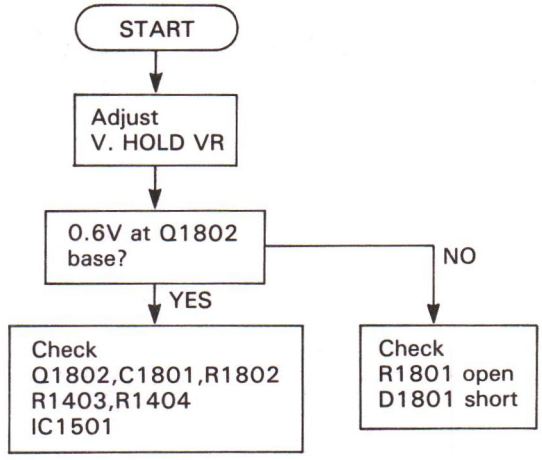
1) Defective horizontal sync.
   This is due to a failure of IC1501 or the horizontal AFC circuit.
2) Defective vertical sync.
   This is due to a failure of the amplifier for the vertical synchronous signal, or the vertical oscillator (IC1501 and its peripheral elements)

[Improper H. sync]

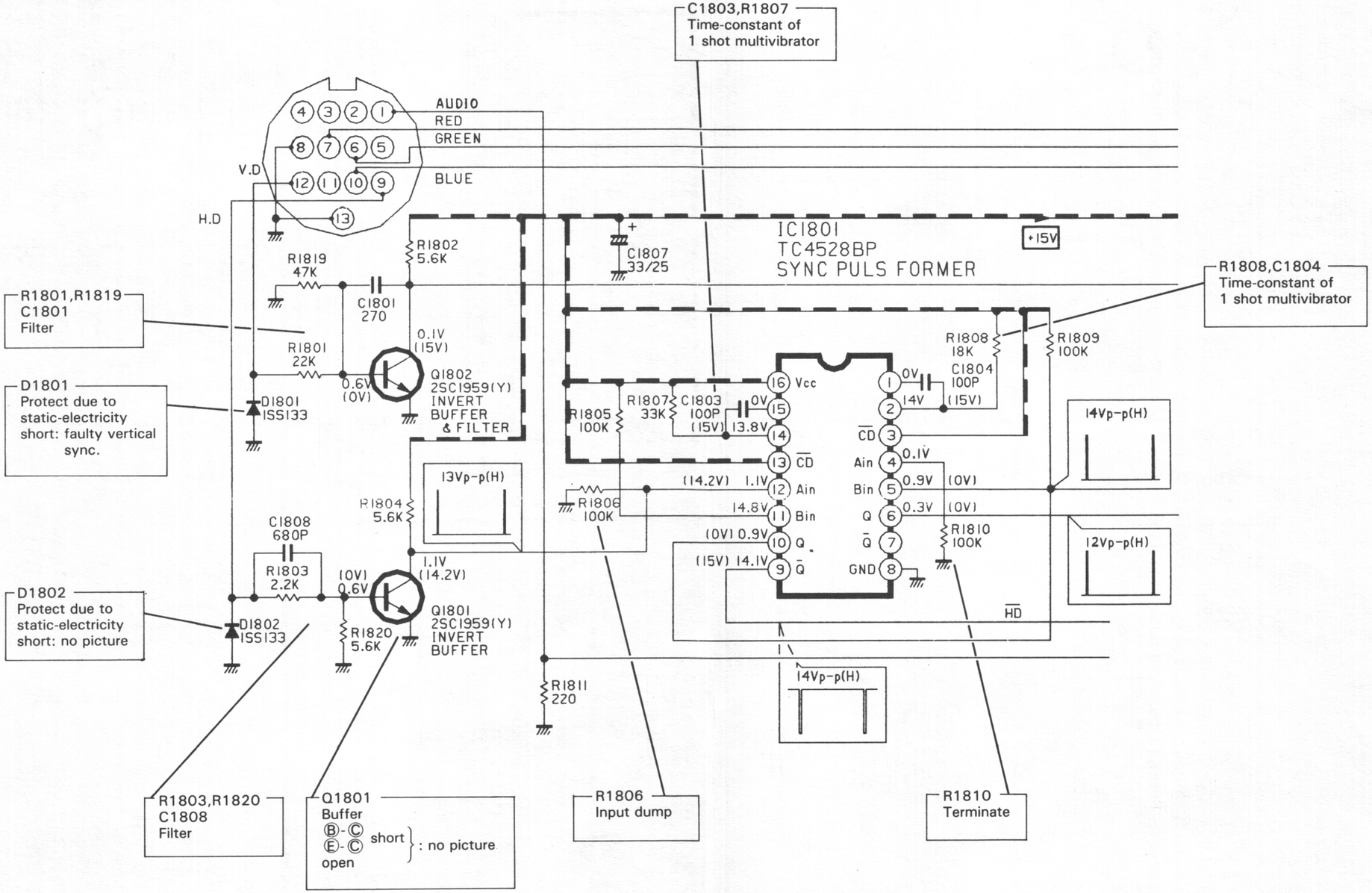
Check

IC1501 faulty
C1501,R1501
R1502,R1504
C1506
IC1801

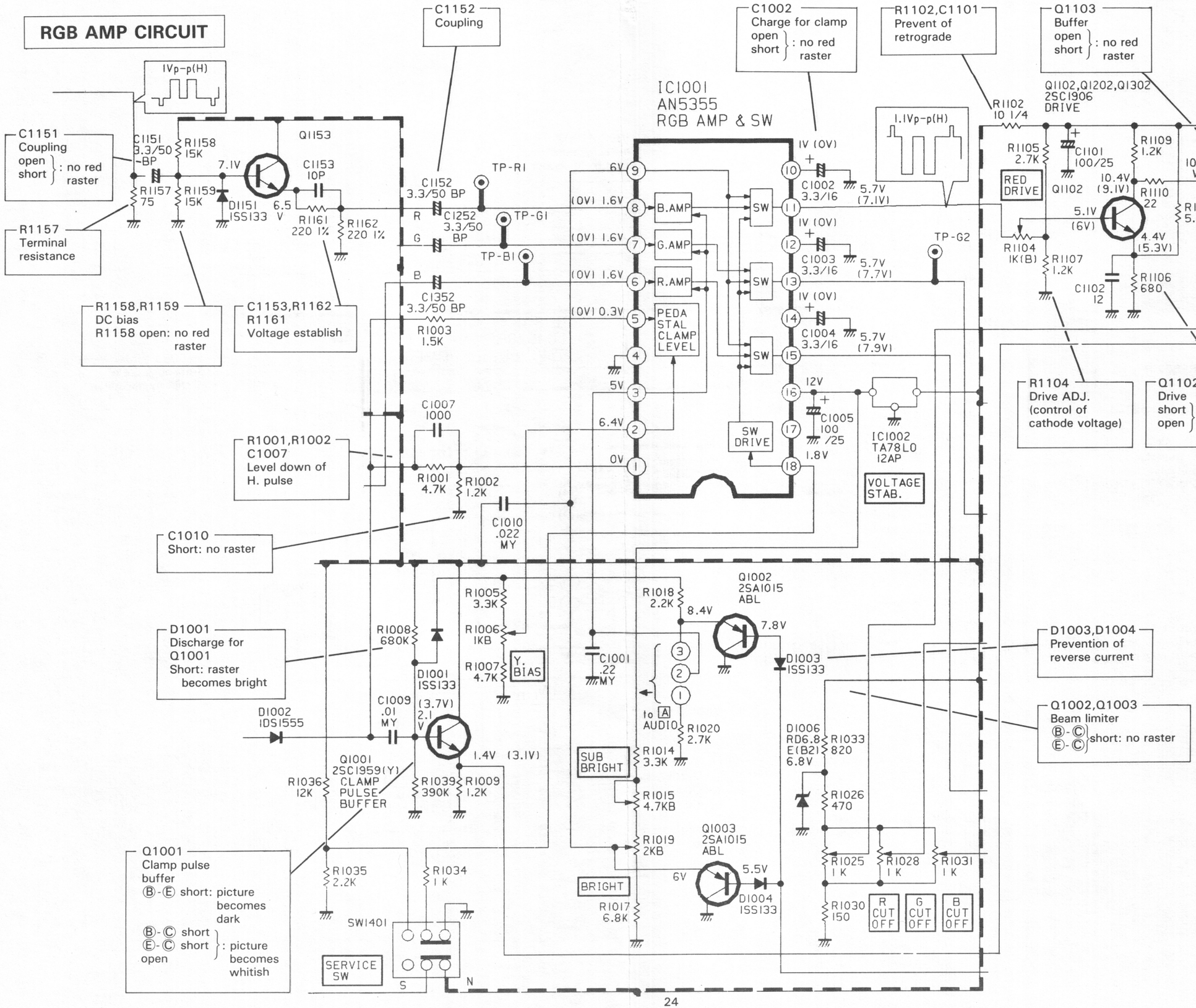
[Improper V. sync.]



SYNC PULSE FORMER



RGB AMP CIRCUIT



C1151
Coupling
open / short : no red raster

R1157
Terminal resistance

R1158,R1159
DC bias
R1158 open: no red raster

C1153,R1162
R1161
Voltage establish

C1152
Coupling

C1002
Charge for clamp
open / short : no red raster

R1102,C1101
Prevent of retrograde

Q1103
Buffer
open / short : no red raster

C1105
Coupling
short / open : red raster

R1001,R1002
C1007
Level down of H. pulse

C1010
Short: no raster

D1001
Discharge for Q1001
Short: raster becomes bright

Q1001
Clamp pulse buffer
Ⓑ-Ⓔ short: picture becomes dark
Ⓑ-Ⓒ short / Ⓔ-Ⓒ short / open : picture becomes whitish

D1003,D1004
Prevention of reverse current

Q1002,Q1003
Beam limiter
Ⓑ-Ⓒ / Ⓔ-Ⓒ short: no raster

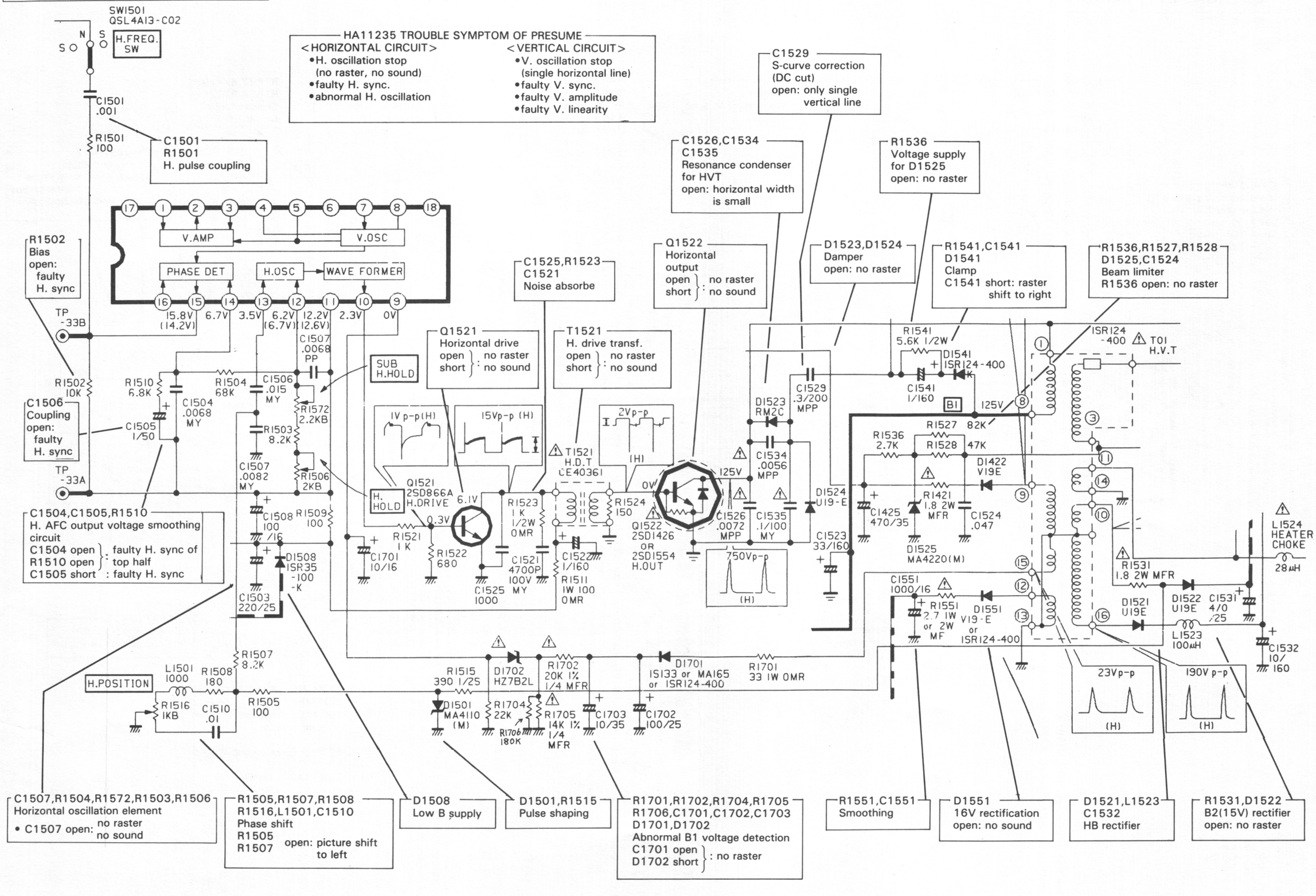
R1104
Drive ADJ.
(control of cathode voltage)

Q1102
Drive
short / open : no red raster

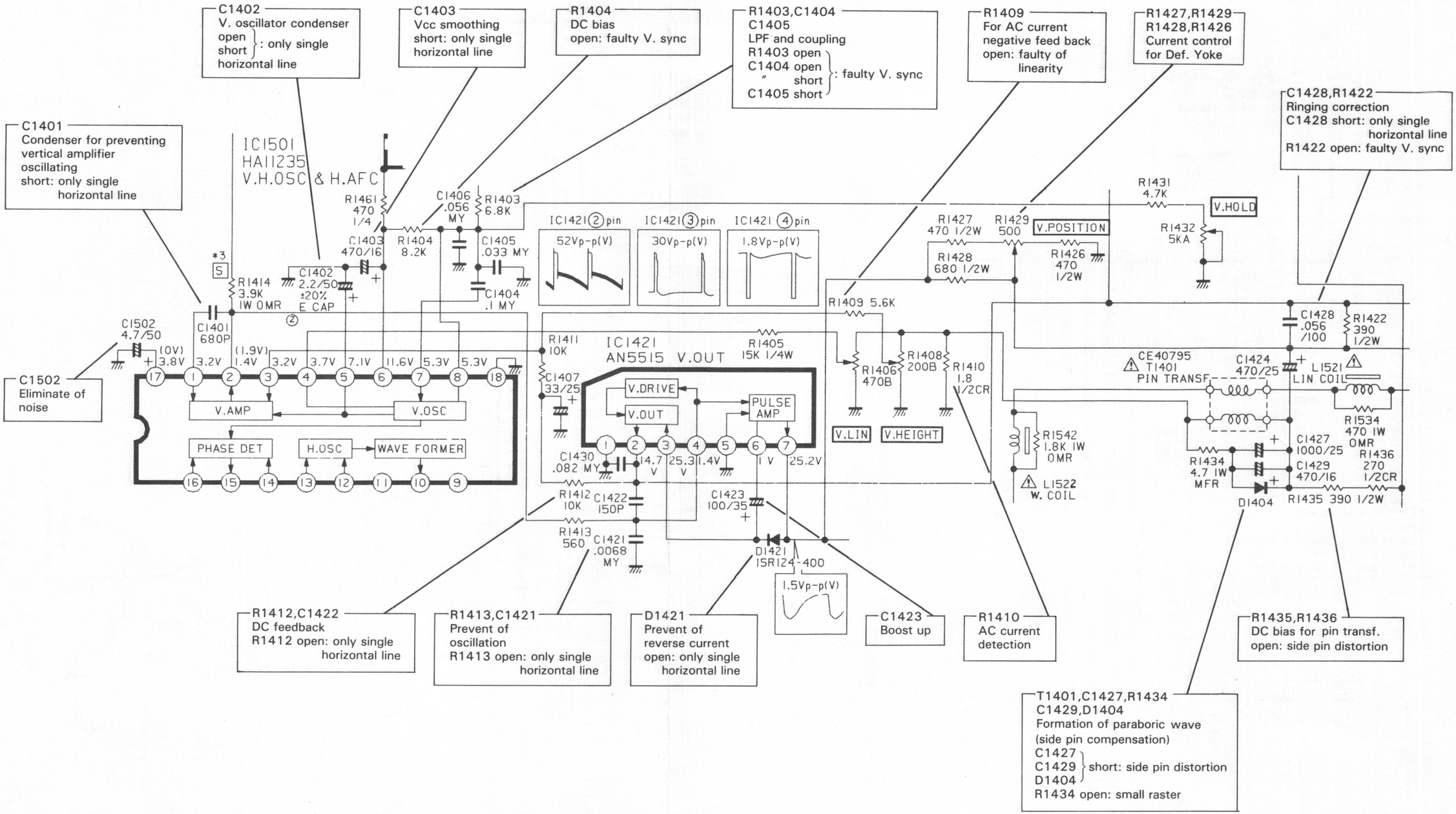
Q1104
Clamp
Ⓑ-Ⓒ / Ⓔ-Ⓒ short: no red raster
open: red raster

C1106
Charge for pedestal clamp
short: no red raster
open: red raster

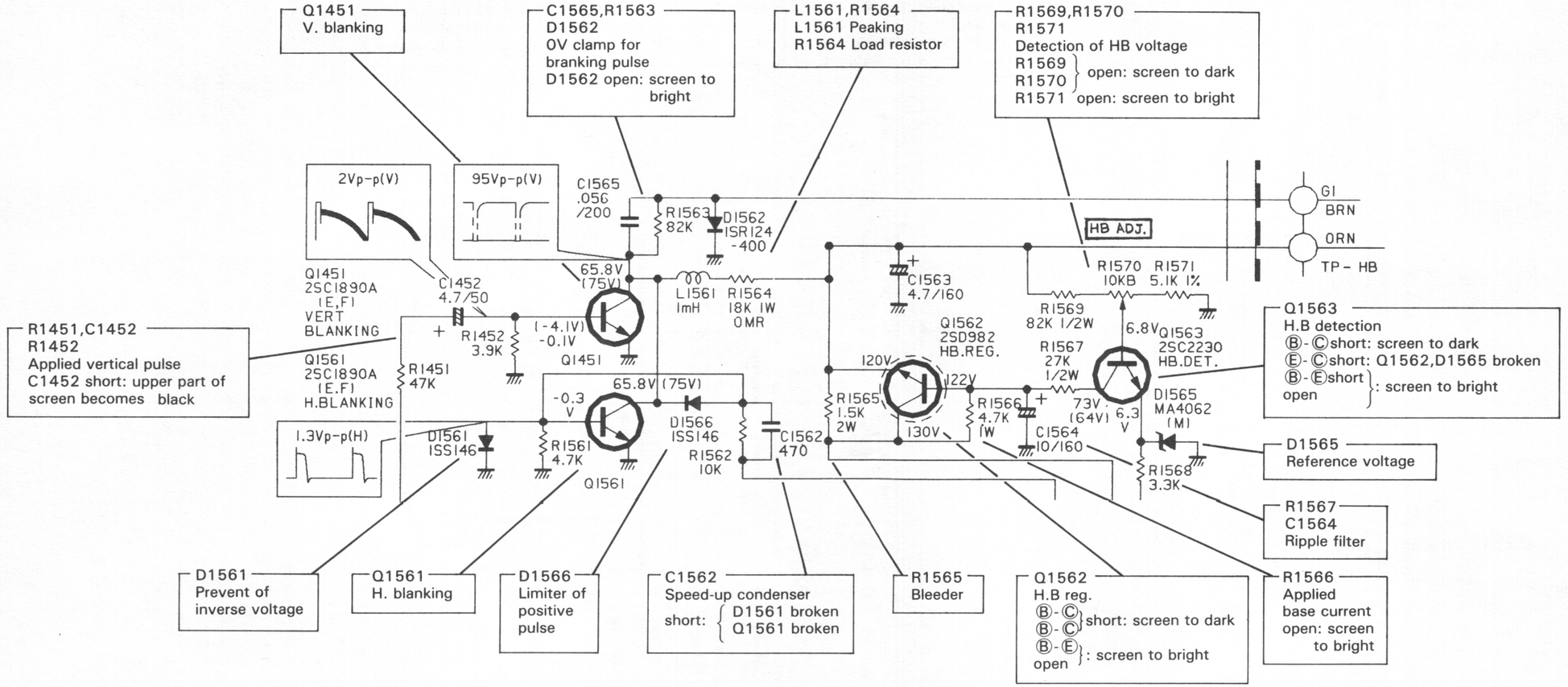
HORIZONTAL DEF. CIRCUIT



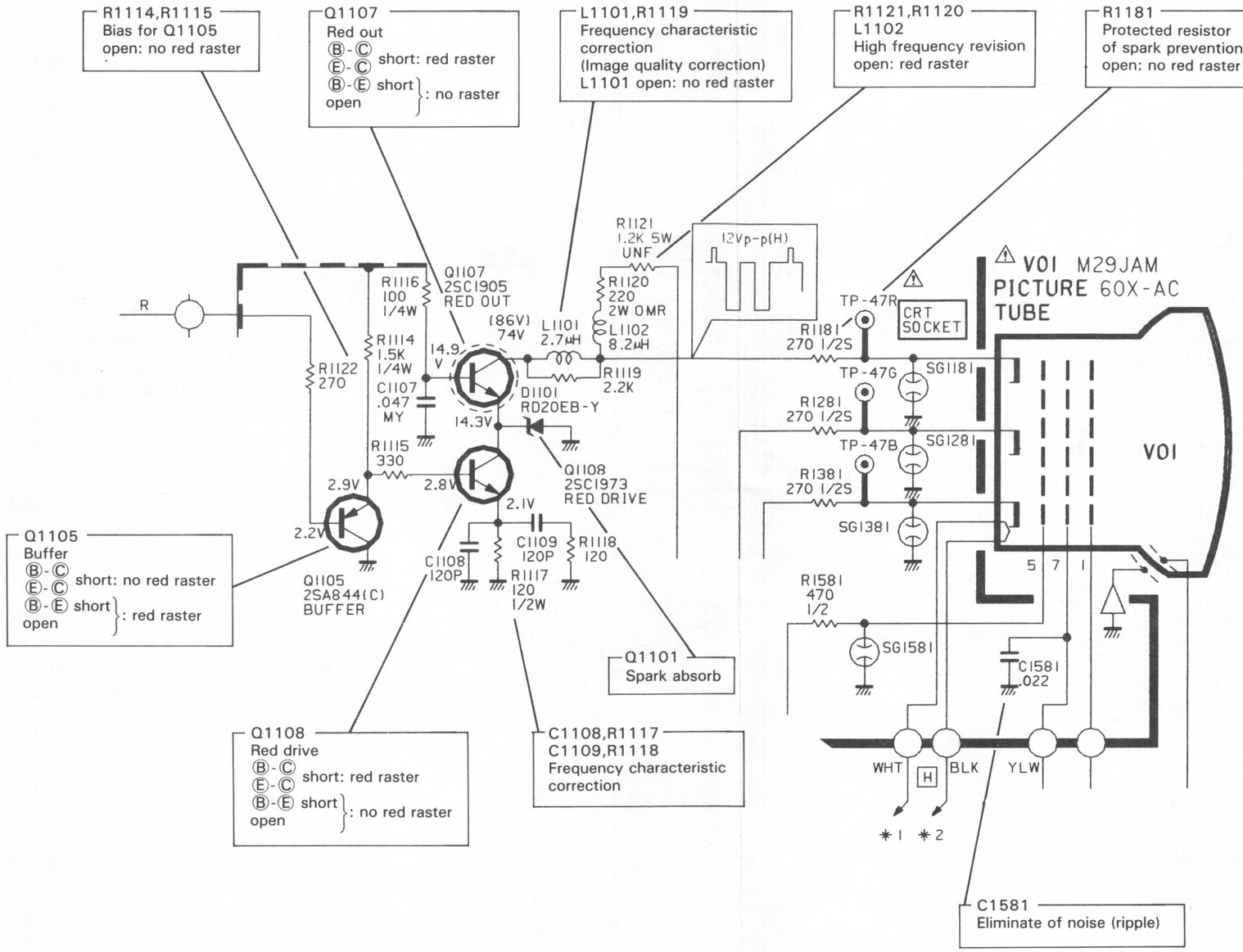
VERTICAL DEF. CIRCUIT



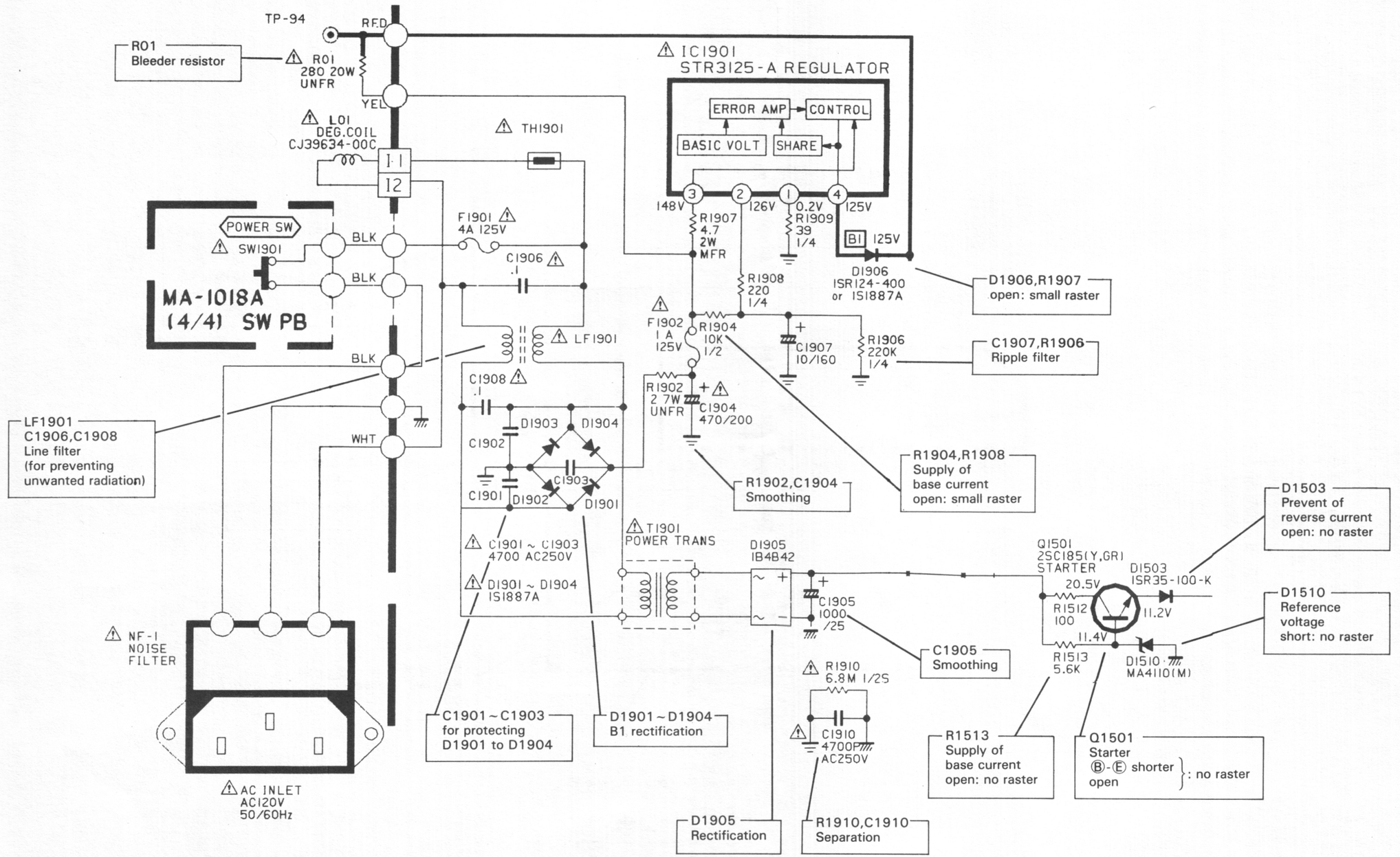
BLANKING & HB REG. CIRCUIT



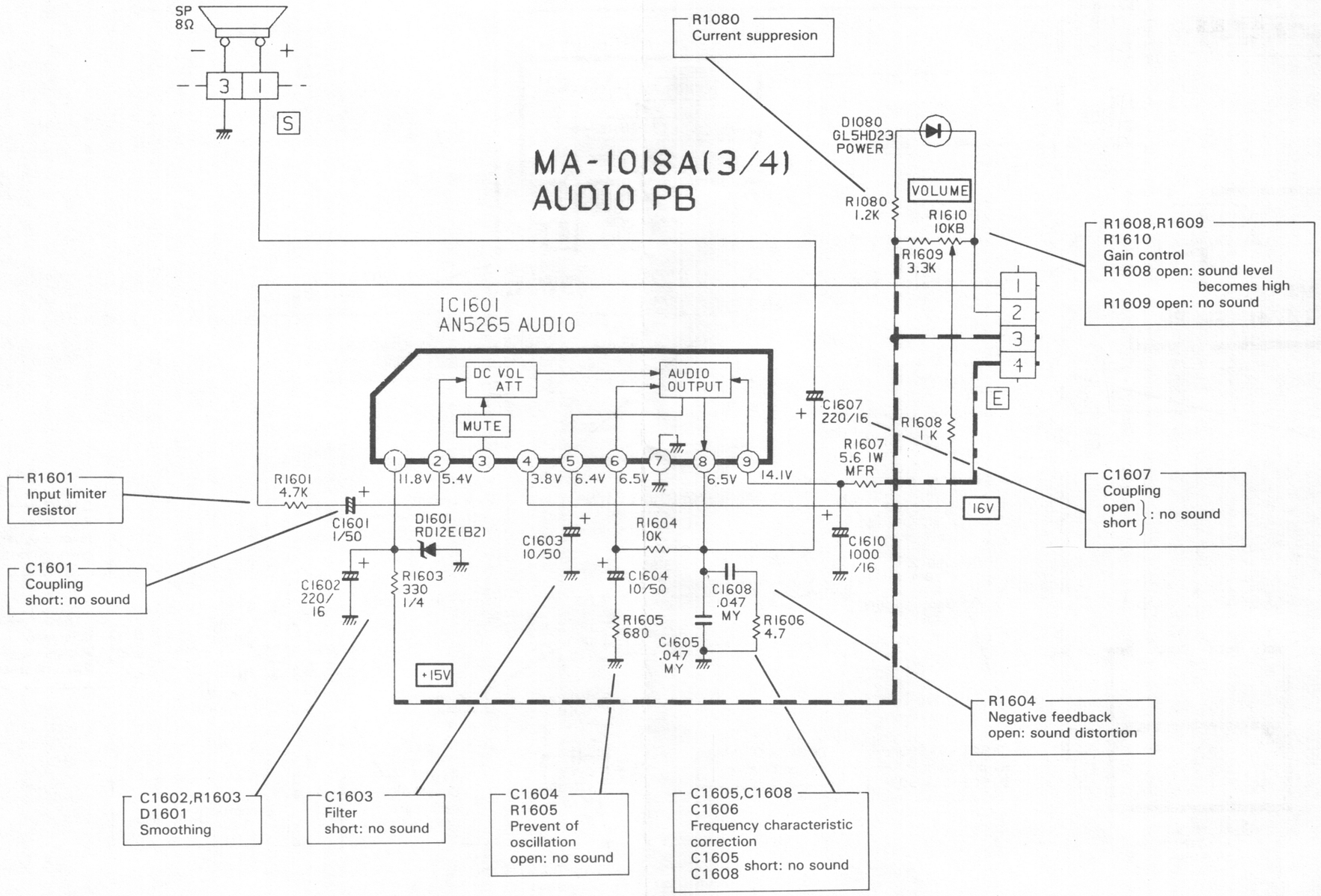
VIDEO OUTPUT CIRCUIT



POWER CIRCUIT

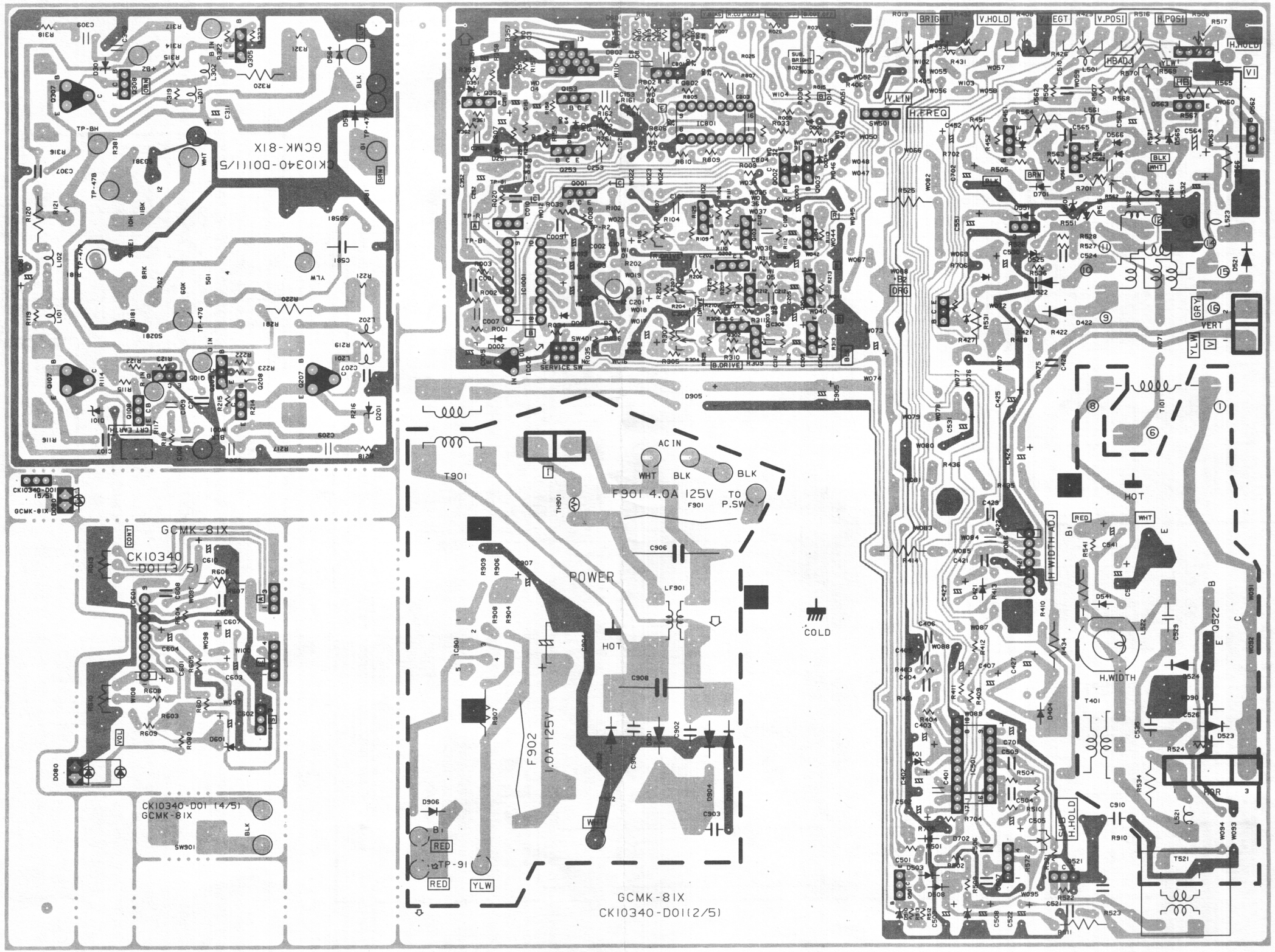


AUDIO CIRCUIT



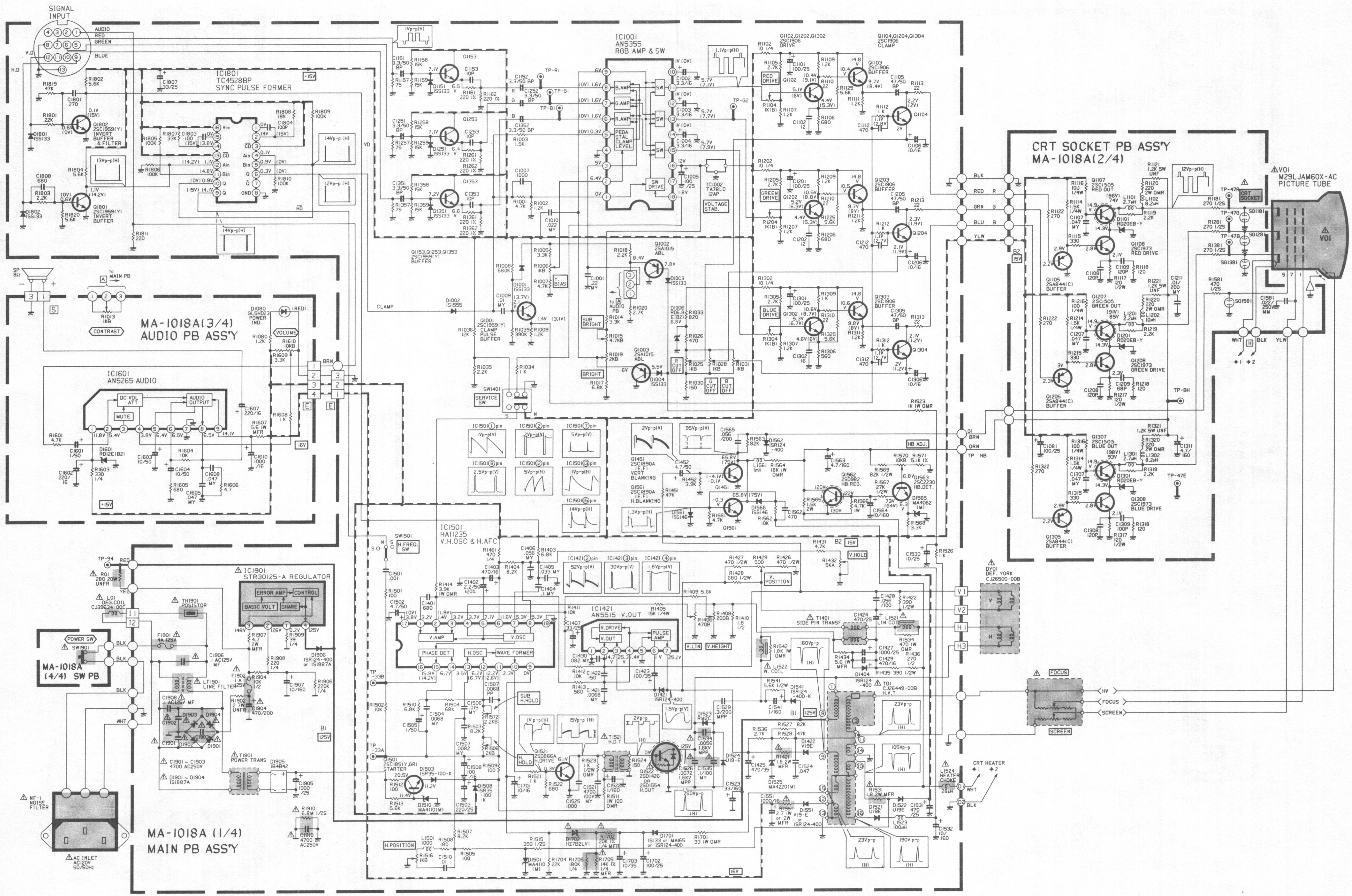
SC1224 VERSION 2

MAIN P.B. BACK PATTERN



SCHEMATIC DIAGRAM

SC1224 VERSION 2



SCHEMATIC DIAGRAM MODEL SC1224 VERSION 2

■ SAFETY PRECAUTIONS

- The FR (FR) is a fusible resistor, thus possessing the function of a fuse. When replacing their fusible resistor or the safety-indicated parts (▩) shown in the circuit diagrams, be sure to use correctly designated parts for safety.
  Also, to ensure safety and maintenance of designated performance, also use the specified items on other components.

■ INDICATED VOLTAGE AND WAVEFORMS

o Voltage/waveforms on respective components are indicated by actually measuring them with a tester or an oscilloscope through display color bar signals of sufficient sensitivity. The volume positions are set as a result of measurement under the condition of factory shipment. Since the signal systems present slightly fluctuating values depending on adjustment and other conditions, the indicated values should be used as reference values. All indicated values represent DC voltage.

Tester used for measuring
Internal resistance DC 20 kΩ/V
Oscilloscoape sweeping time
H → 20 μS/div
V → 5 mS/div
Others → Sweeping time is indicated

■ CIRCUIT DIAGRAM DISPLAY SYMBOLS

1. Resister
   o Resistance value
   When no unit is provided: [Ω]
   K : [kΩ]
   M: [MΩ]
   o Rated permissible power capacity
   When no display is made: 1/6 [W]
   Others: Display are provided
   o Resistor type

No type display	:Carbon resistor
OMR	:Oxidized metal film resistor
UNF	:Cement resistor
MFR	:Metal film resistor
FR	:Fusible resistor

   * Composition resistor 1/2 [W] is displayed as "1/2S" or "comp."

2. Capacitor
   o Capacity
   Over 1 [pF] Below 1 [μF]
   o Withstand voltage
   No display : DC 50 [V]
   Others : DC withstand voltage [V]
   AC display : AC withstand voltage [V]
   o Display of electrolytic capacitor is as follows.
   (Example)
   47/50 → Capacity [μF]/withstand voltage [V]
   o Capacitor type

No type display	: Ceramic capacitor
MY	: Mylar capacitor
MM	: Metallized Mylar capacitor
PP	: Polypropylene capacitor
MPP	: Metallized polypropylene capacitor
NP	: Nonpolar electrolytic capacitor
BP	: Bipolar electrolytic capacitor
TANTAL	: Tantalum capacitor

3. Coil
   When no unit is displayed: [μF]
4. Power supply
   ——— : B1 Voltage (125V)
   ▬▬ : B2 Voltage (15V) ▬▬ : 16V
   * Respective voltage values are indicated.
5. Test point & GND symbol
   ◉ : Test point of mini-GP pin
   ○ : Only test point display
   ⊥ : LIVE side ground
   ⏚ : NEUTRAL side ground
6. Connecting method
   □ : Connector
   ○○ : Wrapping or soldering
   ⊣⊢ : Receptacle

   * Since the reference circuits are provided, the circuits configuration and/or constants are subject to change without prior notice to achieve further improvements.

■ BASINGS OF TRANSISTORS & ICs

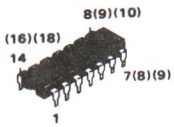
2SA844(C)
2SA1015(O,Y)
2SC1815(Y,GR)
2SC1890A(E,F)
2SC1906
2SC1959(Y)

2SC1973
2SC1627A
2SC2230

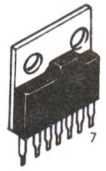
TA78LO12AP

2SC1505
2SD982

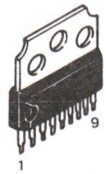
2SD1426



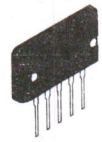
AN5355
TC4528BP



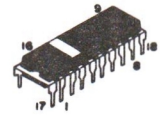
AN5515



AN5265

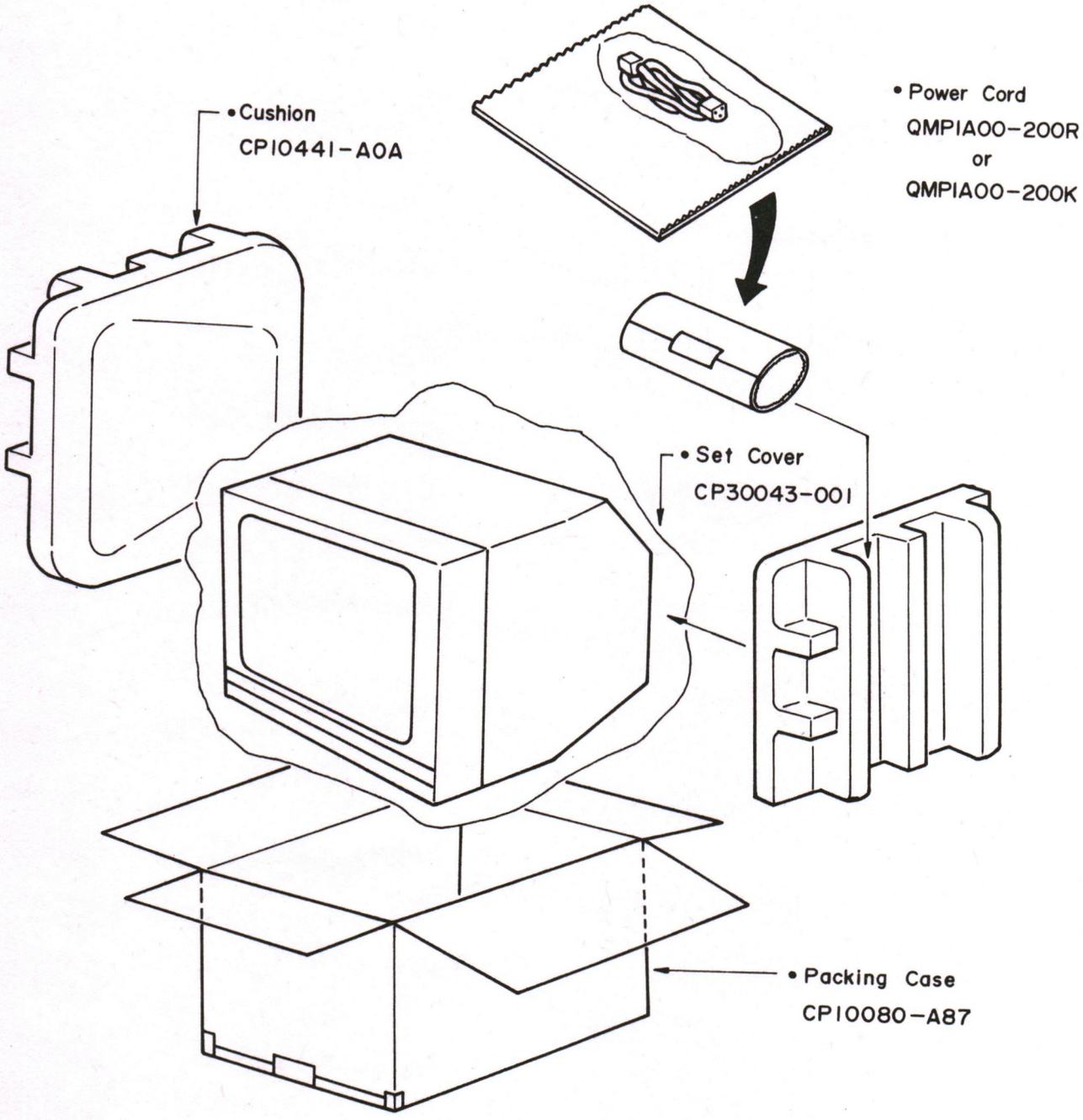


STR3125



HA11244

PACKING DIAGRAM



ATTACHED MATTERS

Instruction Book SC1224V2-IB-A
Waranty Card CM20831-001